Coach

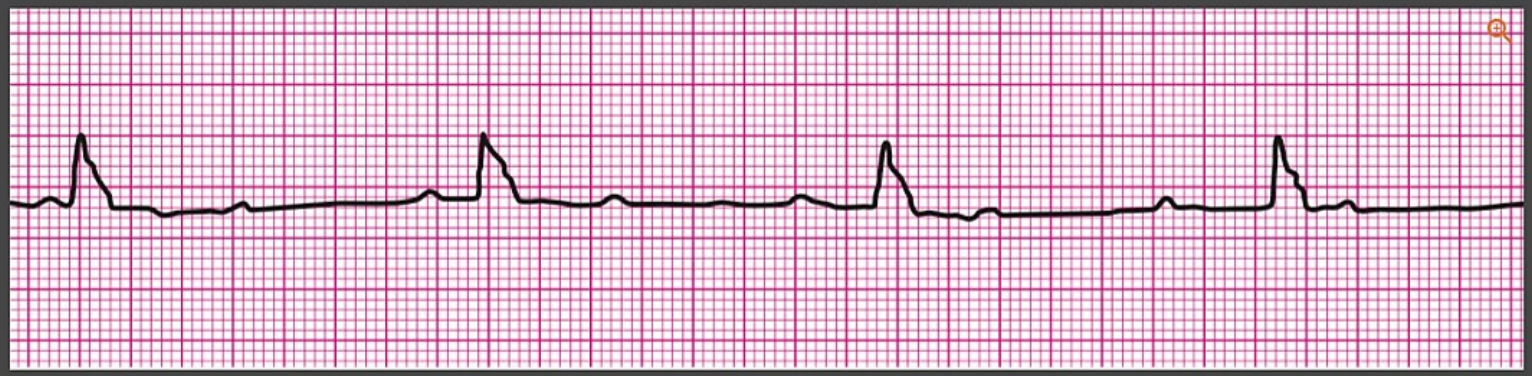
Push ▶ for reading content aloud.

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

What is the patient's rhythm?



You got it!

Your Answer | Third-degree AV block
Learn more

I Know It

CHALLENGE US

NEXT

Coach

Push ▶ for reading content aloud.

You determine that the patient has poor perfusion.

What is your next step?

You got it!

Your Answer

Administer atropine 1 mg IV

Algorithm

Learn more

I Know It

CHALLENGE US

NEXT

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

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The patient does not respond to atropine. The vital signs are **HR** 34/min, **BP** 66/43 mm Hg, **RR** 18/min, and **SpO_2** is 91%. He is responsive, but dizzy.

What options do you have to treat the patient?

SELECT ALL THAT APPLY

- [ ] Perform synchronized cardioversion
- [ ] Administer epinephrine 2 mcg IV
- [x] Administer dopamine 5 to 20 mcg/kg per minute infusion
- [x] Administer epinephrine 2 to 10 mcg per minute infusion
- [x] Initiate transcutaneous pacing

I KNOW IT | THINK I KNOW IT | NOT SURE | NO IDEA

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

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The patient does not respond to atropine. The vital signs are **HR** 34/min, **BP** 66/43 mm Hg, **RR** 18/min, and **SpO_2** is 91%. He is responsive, but dizzy.

What options do you have to treat the patient?

You got it!

Your Answer | Initiate transcutaneous pacing

Your Answer | Administer epinephrine 2 to 10 mcg per minute infusion

Algorithm

Learn more

Your Answer | Administer dopamine 5 to 20 mcg/kg per minute infusion

I Know It

CHALLENGE US

NEXT

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

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The patient does not respond to treatments. The vital signs are **HR** 40/min (weak pulse), **BP** 66/43 mm Hg, **RR** 18/min, and **SpO_2** 91%. He is responsive but states that he feels tired.

What should you consider?

You got it!

Your Answer | Seek expert consultation

Your Answer | Prepare for transvenous pacing

Algorithm

Learn more

I Know It

CHALLENGE US

NEXT

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

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TACHYCARDIA INTRODUCTION

Identifying Tachycardia

A **tachycardia**—that is, a **heart rate greater than 100/min**—has many potential causes and may be **symptomatic or asymptomatic**. Symptomatic tachycardia has signs and symptoms due to the rapid heart rate.

- The rate takes on clinical significance at its extremes and is more likely attributable to an arrhythmia if the heart rate is **150/min or greater**.
- It is unlikely that symptoms of instability are caused primarily by the tachycardia when the heart rate is **less than 150/min** unless the patient has impaired ventricular function.

The key to managing a patient with any tachycardia is to **determine whether pulses are present.** If pulses are present, determine whether the patient is stable or unstable, and then provide treatment based on the patient's condition and rhythm.

If the tachycardia is sinus tachycardia, conduct a diligent search for the cause of the tachycardia. Treating and correcting this cause will improve the patient's signs and symptoms. Cardioversion is not indicated for tachycardia.

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

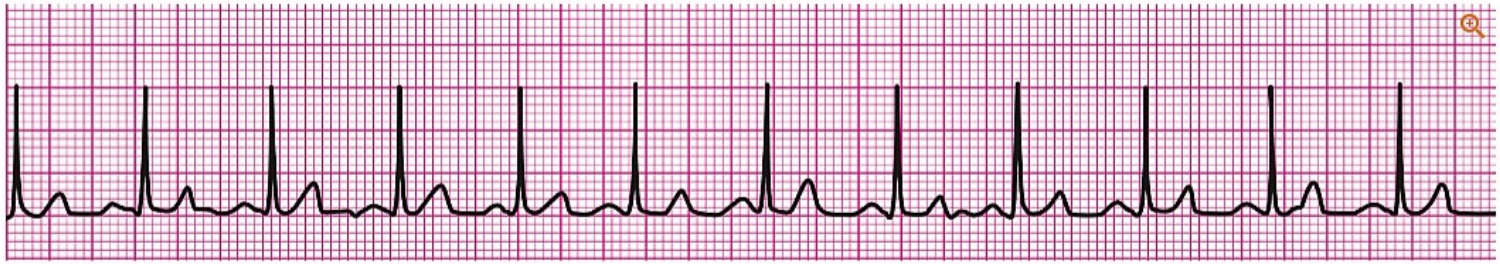
Push ▶ for reading content aloud.

TACHYCARDIA INTRODUCTION

Rhythms for Unstable Tachycardia

- Sinus tachycardia
- Atrial fibrillation
- Atrial flutter
- Supraventricular tachycardia (SVT)
- Monomorphic VT
- Polymorphic VT
- Wide-complex tachycardia of uncertain type

Sinus tachycardia



PREVIOUS 1 2 3 NEXT

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

CHALLENGE US

Coach

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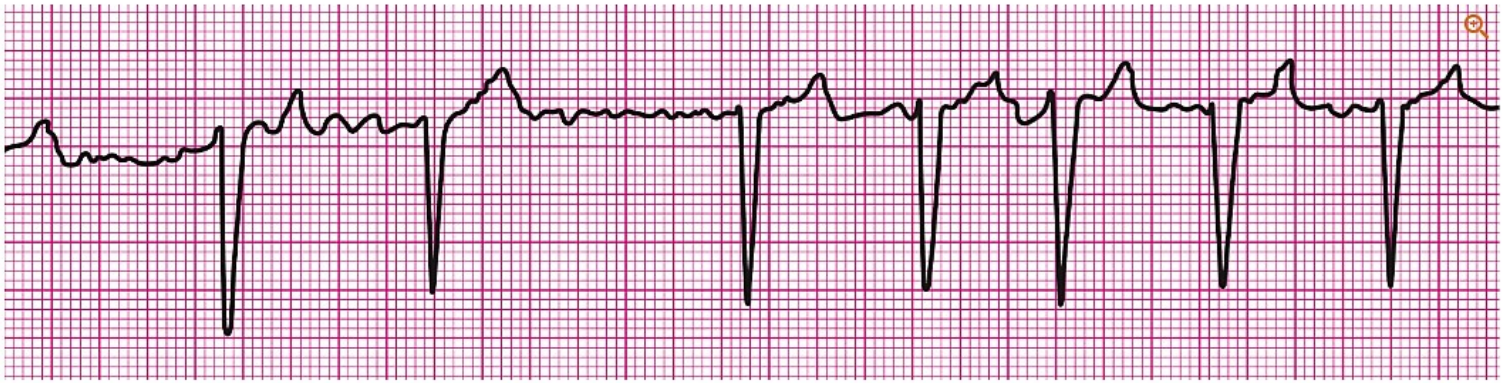
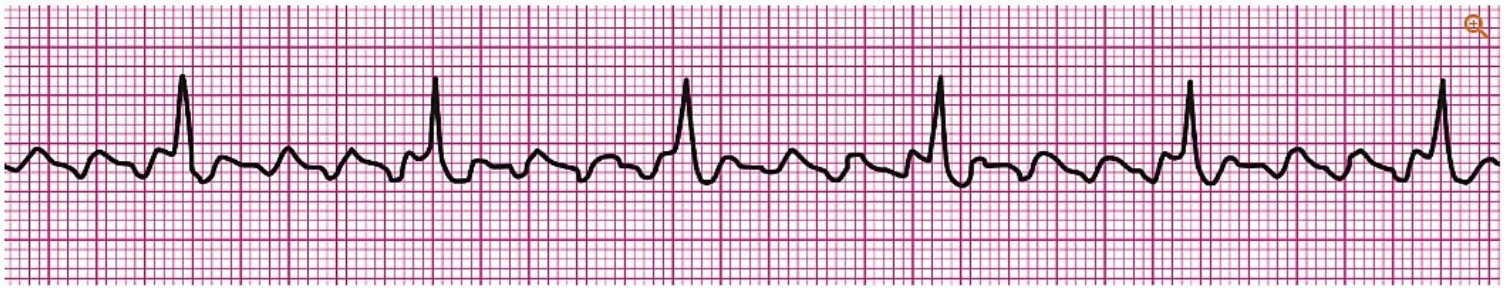
TACHYCARDIA INTRODUCTION

Atrial fibrillation



Atrial flutter



PREVIOUS 1 2 3 NEXT

CHALLENGE US

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

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TACHYCARDIA INTRODUCTION

Supraventricular tachycardia

Monomorphic ventricular tachycardia

PREVIOUS 1 2 3 NEXT

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

CHALLENGE US

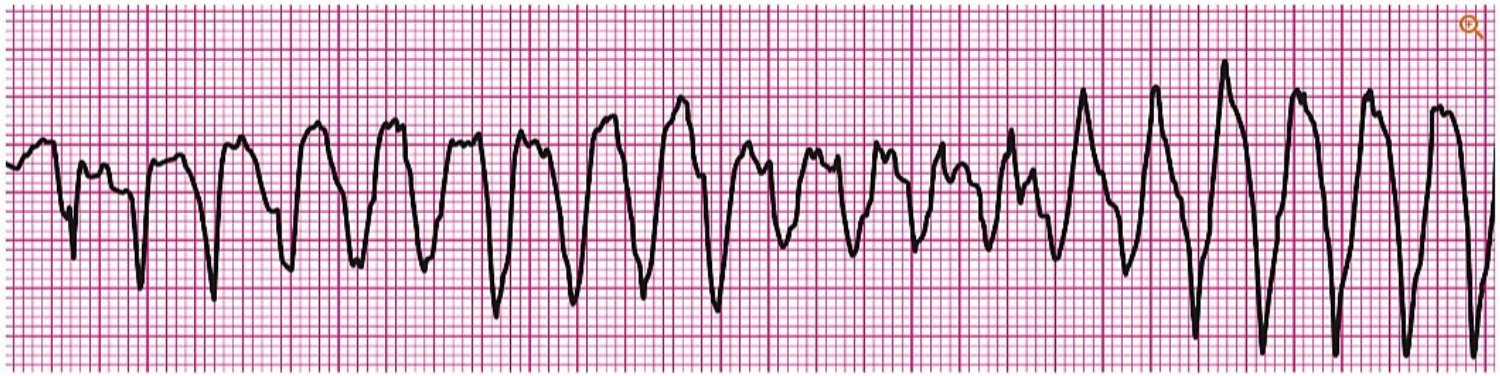
Coach

Push ▶ for reading content aloud.

TACHYCARDIA INTRODUCTION

Monomorphic ventricular tachycardia

Polymorphic ventricular tachycardia



PREVIOUS 1 2 3 NEXT

CHALLENGE US

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

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TACHYCARDIA INTRODUCTION

Rhythms for Stable Tachycardia

Tachycardia classifications include the appearance of the **QRS complex**, **heart rate**, and whether they are **regular or irregular.**

Narrow-QRS complex (SVT) tachycardias (QRS less than 0.12 second) (in order of frequency)

- Sinus tachycardia
- Atrial fibrillation
- Atrial flutter
- AV nodal reentry

Wide-QRS complex tachycardias (QRS 0.12 second or more)

- Monomorphic VT
- Polymorphic VT
- SVT with aberrancy

PREVIOUS 1 2 3

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

I KNEW | GOT IT NOW | THINK I GOT IT | I DON'T GET IT

CHALLENGE US

Coach

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TACHYCARDIA INTRODUCTION

Tachycardia classifications include the appearance of the **QRS complex**, **heart rate**, and whether they are **regular or irregular**.

Narrow-QRS complex (SVT) tachycardias (QRS less than 0.12 second) (in order of frequency)

- Sinus tachycardia
- Atrial fibrillation
- Atrial flutter
- AV nodal reentry

Wide-QRS complex tachycardias (QRS 0.12 second or more)

- Monomorphic VT
- Polymorphic VT
- SVT with aberrancy

Regular or irregular tachycardias

- Irregular narrow-complex tachycardias are probably atrial fibrillation

PREVIOUS 1 2 3

I KNEW | GOT IT NOW | THINK I GOT IT | I DON'T GET IT

CHALLENGE US

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

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SIGNS AND SYMPTOMS OF UNSTABLE TACHYCARDIA

Pathophysiology of Unstable Tachycardia

Unstable tachycardia exists when the heart rate is too fast for the patient's clinical condition. This excessive heart rate causes symptoms or an unstable condition because the heart is

- **Beating so fast** that cardiac output is reduced; this can cause pulmonary edema, coronary ischemia, and hypotension with reduced blood flow to vital organs (eg, brain, kidneys)
- **Beating ineffectively**, so that coordination between the atrium and ventricles or the ventricles themselves reduces cardiac output

Signs and Symptoms

Unstable tachycardia leads to serious signs and symptoms that include

- Hypotension
- Acutely altered mental status
- Signs of shock
- Ischemic chest discomfort
- Acute heart failure

CHALLENGE US

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

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SIGNS AND SYMPTOMS OF UNSTABLE TACHYCARDIA

Rapid Recognition

The 2 keys to managing unstable tachycardia are rapidly recognizing that

1 The patient is significantly symptomatic or even unstable

2 The signs and symptoms are caused by the tachycardia

Quickly determine whether the tachycardia is producing hemodynamic instability or the serious signs and symptoms (eg, the pain and distress of an acute myocardial infarction) are the cause of the tachycardia.

Making this determination can be difficult. Many experts suggest that **when a heart rate is less than 150/min, the symptoms of instability are not likely caused primarily by the tachycardia** unless ventricular function is impaired. A heart rate of 150/min or less is usually an appropriate response to physiologic stress (eg, fever, dehydration) or other underlying conditions.

Assess frequently for the presence or absence of signs and symptoms and for their severity.

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

I KNEW | GOT IT NOW | THINK I GOT IT | I DON'T GET IT

CHALLENGE US

62% | PROGRESS: HeartCode ACLS 2025

~3h 51m left

Ahmed Othman A

Coach

Learn more here:

Signs and Symptoms of...

You are treating a patient with a **heart rate** of **186/min**. Which **symptom** (if present) suggests an **unstable tachycardia**?

You got it!

Your Answer | **Hypotension**

I Know It

CHALLENGE US

NEXT

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

63% PROGRESS: HeartCode ACLS 2025

~3h 47m left

Ahmed Othman A

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Learn more here:

Signs and Symptoms of...

Symptoms of instability are not usually caused by **heart rates less than** 150/min unless ventricular function is impaired.

You got it!

I Know It

CHALLENGE US

NEXT

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

Push ▶ for reading content aloud.

ADULT TACHYCARDIA WITH A PULSE ALGORITHM

The Adult Tachycardia With a Pulse Algorithm

The **Adult Tachycardia With a Pulse Algorithm** simplifies initial management of tachycardia. The presence or absence of pulses is considered the key to managing patients with any tachycardia. If a **pulseless tachycardia is present**, then manage the patient according to the **PEA pathway** of the Adult Cardiac Arrest Algorithm. **If pulses are present**, determine whether the patient is stable or unstable, and then provide treatment based on the patient's condition and rhythm.

To manage unstable tachycardia, ACLS providers should be experts or obtain expert consultation. Actions in the steps require advanced knowledge of ECG rhythm interpretation and antiarrhythmic therapy; these actions should take place in-hospital with expert consultation available.

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

Push ▶ for reading content aloud.

ADULT TACHYCARDIA WITH A PULSE ALGORITHM

Assess Clinical Condition

Use the **BLS, Primary, and Secondary Assessments** to guide your approach.

- Look for signs of **increased work of breathing** (tachypnea, intercostal retractions, suprasternal retractions, paradoxical abdominal breathing) and **hypoxemia** as determined by pulse oximetry.

Identify and Treat the Underlying Cause

Identify and treat underlying cause:

- **Maintain patent airway**; assist breathing as necessary.
- **Give oxygen** (if hypoxemic).
- **Use a cardiac monitor** to identify rhythm; monitor blood pressure and oximetry.
- **Establish IV** access.
- **Obtain a 12-lead ECG** if available.

If symptoms persist despite support of adequate oxygenation and ventilation, proceed to the next step.

Adult Tachycardia With a Pulse Algorithm

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

CHALLENGE US

Coach

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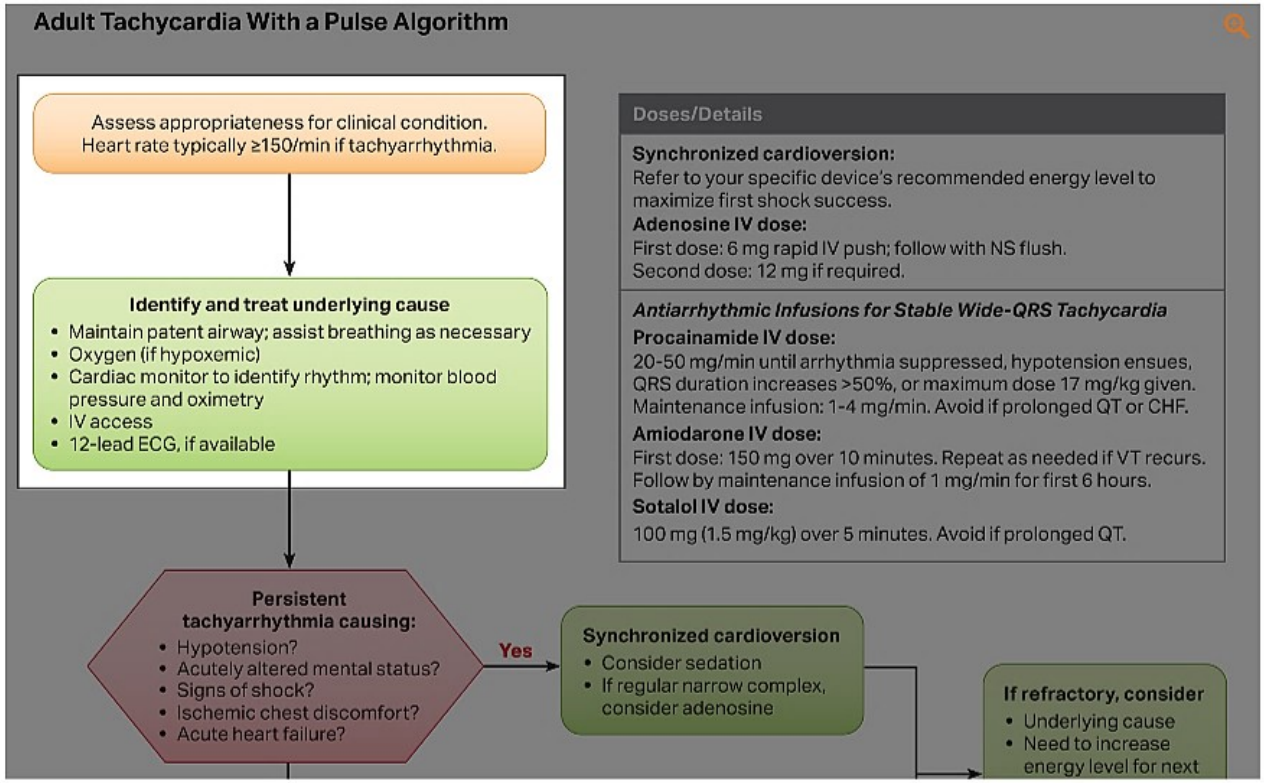
ADULT TACHYCARDIA WITH A PULSE ALGORITHM



PREVIOUS 1 2 3 4 5 NEXT

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

CHALLENGE US

Coach

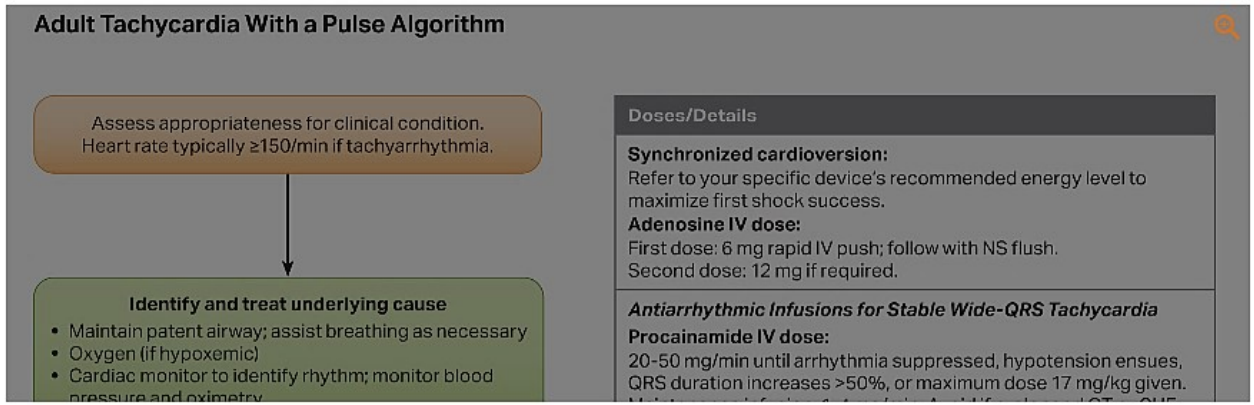
Push ▶ for reading content aloud.

ADULT TACHYCARDIA WITH A PULSE ALGORITHM

Is the Persistent Tachycardia Causing Serious Signs and Symptoms?

These key questions in the Tachycardia Algorithm will guide your assessment of this patient and help determine your next steps:

- Are symptoms present or absent?
- Is the patient stable or unstable?
- Is the QRS narrow or wide?
- Is the rhythm regular or irregular?
- Is the QRS monomorphic or polymorphic?



CHALLENGE US

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

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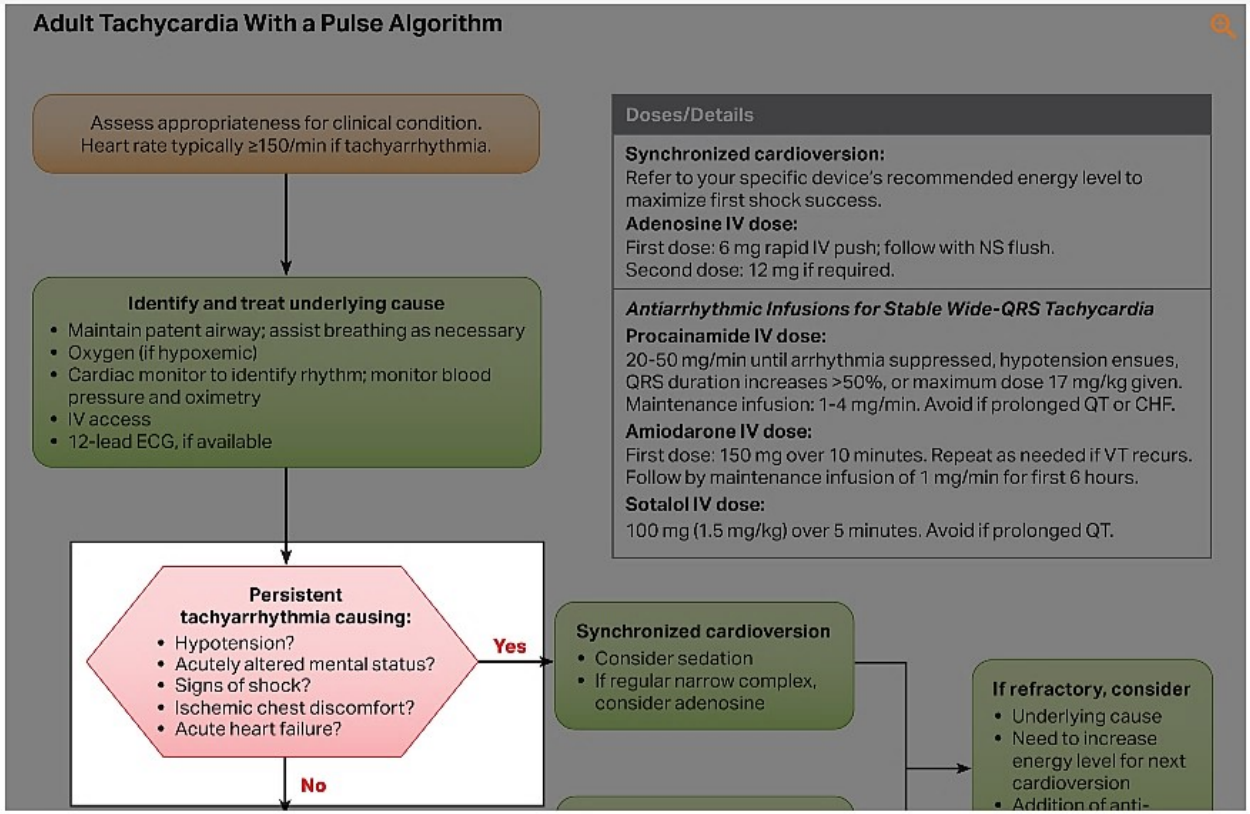
ADULT TACHYCARDIA WITH A PULSE ALGORITHM



PREVIOUS 1 2 3 4 5 NEXT

CHALLENGE US

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

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ADULT TACHYCARDIA WITH A PULSE ALGORITHM

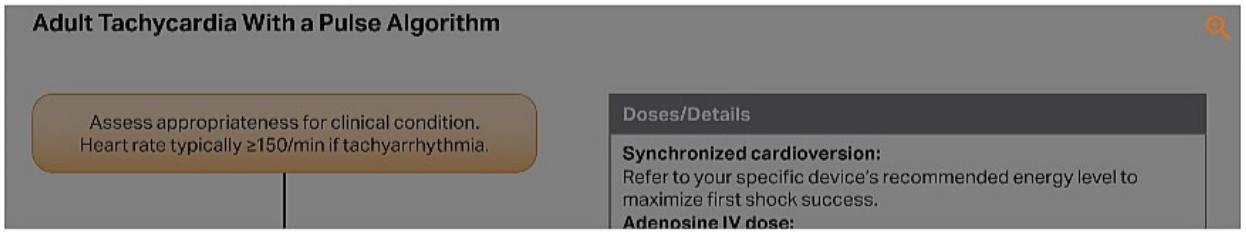
Stable and Unstable Tachycardia

The **tachycardia is unstable** if signs and symptoms persist after the patient receives supplemental oxygen and airway and circulation support and if significant signs or symptoms are due to the tachycardia. In this case, **immediate synchronized cardioversion** is indicated.

Stable tachycardia refers to a condition in which the patient has a **heart rate greater than 100/min, no significant signs or symptoms** caused by the increased rate, and a potential underlying **cardiac electrical abnormality** that generates the rhythm. In this case, **evaluate the ECG and determine if the QRS complex is wide or narrow and whether it is regular or irregular.**

Determine the Width of the QRS Complex

- If the width of the QRS complex is **0.12 seconds or more**, consider expert consultation.
- If the width of the QRS complex is **less than 0.12 seconds**, treat with vagal maneuvers and adenosine if there is a regular rhythm.



CHALLENGE US

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

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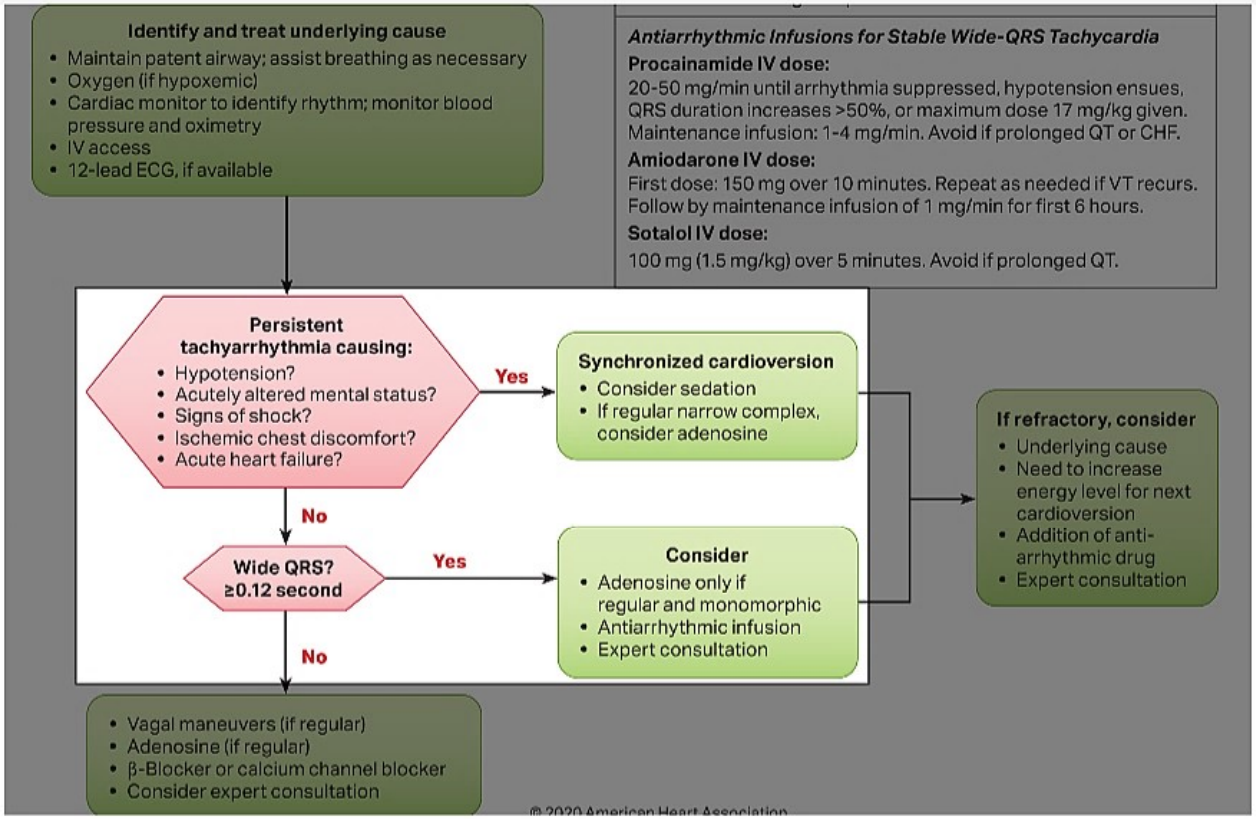
ADULT TACHYCARDIA WITH A PULSE ALGORITHM



PREVIOUS 1 2 3 4 5 NEXT

CHALLENGE US

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

64% PROGRESS: HeartCode ACLS 2025

~3h 44m left

Ahmed Othman A

Coach

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What is the **first-line treatment** for **unstable tachycardia?**

CHOOSE THE CORRECT ANSWER

- ✓ Cardioversion
- Amiodarone
- Lidocaine
- Adenosine

I KNOW IT | THINK I KNOW IT | NOT SURE | NO IDEA

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

Learn more here:

Adult Tachycardia with ...

What is the **first-line treatment** for **unstable tachycardia?**

You got it!

Your Answer | **Cardioversion**

I Know It

CHALLENGE US

NEXT

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

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The width of the QRS in a patient presenting with tachycardia is **0.16 seconds**. Each QRS complex has a **visible P wave**.

How would you **classify** this **tachycardia?**

CHOOSE THE CORRECT ANSWER

- ✓ Wide-complex tachycardia
- Sinus tachycardia
- Narrow-complex tachycardia
- Left bundle branch block

I KNOW IT | THINK I KNOW IT | NOT SURE | NO IDEA

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

Learn more here:

Adult Tachycardia with ...

The width of the QRS in a patient presenting with tachycardia is **0.16 seconds.** Each QRS complex has a **visible P wave.**

How would you **classify** this **tachycardia**?

You got it!

Your Answer | **Wide-complex tachycardia**

I Know It

CHALLENGE US

NEXT

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

Push ▶ for reading content aloud.

The width of the QRS in a patient presenting with tachycardia is **0.10 second**. There are **no clearly discernable P waves**.

How would you **classify** this **tachycardia**?

CHOOSE THE CORRECT ANSWER

- Wide-complex tachycardia
- Ventricular tachycardia
- Left bundle branch block
- ✓ Narrow-complex tachycardia

I KNOW IT | THINK I KNOW IT | NOT SURE | NO IDEA

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

Coach

Learn more here:

Adult Tachycardia with ...

The width of the QRS in a patient presenting with tachycardia is **0.10 second**. There are **no clearly discernable P waves**.

How would you **classify** this **tachycardia?**

You got it!

Your Answer | Narrow-complex tachycardia

I Know It

CHALLENGE US

NEXT

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

Push ▶ for reading content aloud.

SINUS TACHYCARDIA

Understanding Sinus Tachycardia

Sinus tachycardia is a **heart rate that is greater than 100/min**, has P waves, and is generated by sinus node discharge. The heart rate in tachycardia typically does not exceed 220/min and is age related. Sinus tachycardia usually does not exceed 120 to 130/min, and it has a gradual onset and gradual termination. Reentry SVT has an abrupt onset and termination.

Note that sinus tachycardia is excluded from the Tachycardia With a Pulse Algorithm. **Sinus tachycardia is caused by external influences on the heart**, such as fever, anemia, hypotension, blood loss, or exercise—systemic, not cardiac, conditions. Sinus tachycardia is a regular rhythm, although the rate may be slowed by vagal maneuvers. **In sinus tachycardia, the goal is to identify and correct the underlying systemic cause, and cardioversion is contraindicated.**

β-Blockers may cause clinical deterioration if the cardiac output falls when a compensatory tachycardia is blocked. This is because cardiac output is determined by the volume of blood ejected by the ventricles with each contraction (stroke volume) and the heart rate.

Cardiac output (CO)= Stroke volume (SV) × Heart rate

If a condition such as a large acute myocardial infarction (AMI) limits ventricular function (severe heart failure or cardiogenic shock), the heart compensates by increasing the heart rate. If you attempt to reduce the heart rate in patients with a compensatory tachycardia, cardiac output will fall, and the patient's condition will likely deteriorate.

I KNEW | GOT IT NOW | THINK I GOT IT | I DON'T GET IT

CHALLENGE US

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

65% PROGRESS: HeartCode ACLS 2025

~3h 40m left

Ahmed Othman A

Coach

Push ▶ for reading content aloud.

What is the **upper heart rate limit** for a patient with **sinus tachycardia?**

CHOOSE THE CORRECT ANSWER

180/min

✓ 130/min

150/min

200/min

I KNOW IT | THINK I KNOW IT | NOT SURE | NO IDEA

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

LTI does not have a session time

65% PROGRESS: HeartCode ACLS 2025

~3h 40m left

Ahmed Othman A

Coach

Learn more here:

Sinus Tachycardia

What is the **upper heart rate limit** for a patient with **sinus tachycardia?**

You got it!

Your Answer | **130/min**

I Know It

CHALLENGE US

NEXT

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

Push ▶ for reading content aloud.

What is the **lower heart rate limit** for a patient with **sinus tachycardia?**

CHOOSE THE CORRECT ANSWER

130/min

✓ 120/min

150/min

100/min

I KNOW IT | THINK I KNOW IT | NOT SURE | NO IDEA

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

66% PROGRESS: HeartCode ACLS 2025

~3h 36m left

Ahmed Othman A

Coach

Maybe this can help you?

Sinus Tachycardia

What is the **lower heart rate limit** for a patient with **sinus tachycardia**?

Not there yet...

Your Answer | 120/min

Correct Answer | 100/min

Learn more here: Sinus Tachycardia

I Know It

CHALLENGE US

NEXT

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

Push ▶ for reading content aloud.

VAGAL MANEUVERS AND ADENOSINE

Narrow QRS, Regular Rhythm

The therapy for **narrow QRS** with **regular rhythm** is to attempt **vagal maneuvers**, **give adenosine**, **give a β-blocker or calcium channel blocker**, **and consider expert consultation.** Vagal maneuvers, adenosine, and β-blocker or calcium channel blockers are the preferred initial interventions for terminating narrow-complex tachycardias that are symptomatic (but stable) and supraventricular in origin.

Valsalva maneuvers or carotid sinus massage alone will terminate about 25% of SVTs, and adenosine is required for the remainder.

- **If SVT does not respond to vagal maneuvers**, give **adenosine 6 mg IV** (follow with saline flush) in a large vein over 1 second and **elevate the arm immediately**.
- **If SVT does not convert within 1 to 2 minutes**, give a **second dose** of **adenosine 12 mg IV** (follow with saline flush) following the same procedure above.

CHALLENGE US

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

Push ▶ for reading content aloud.

VAGAL MANEUVERS AND ADENOSINE

Adenosine

Adenosine **increases AV block** and **will terminate approximately 90% of reentry arrhythmias within 2 minutes**. Adenosine **will not terminate atrial flutter or atrial fibrillation** but will slow AV conduction, allowing you to identify flutter or fibrillation waves.

Adenosine is **safe and effective in pregnancy**, but it has several important drug interactions. Patients with significant blood levels of theophylline, caffeine, or theobromine may require larger doses, and you should reduce the initial dose to 3 mg IV for patients taking dipyridamole or carbamazepine. Because of recent case reports of prolonged asystole after adenosine administration to patients with transplanted hearts or after central venous administration, you may consider lower doses such as 3 mg IV in these situations.

Adenosine may cause **bronchospasm**, so generally, you **should not give adenosine to patients with asthma or chronic obstructive pulmonary disease**, particularly if patients are actively bronchospastic.

PREVIOUS 1 2 3 NEXT

CHALLENGE US

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

Push ▶ for reading content aloud.

VAGAL MANEUVERS AND ADENOSINE

Adenosine: Rhythm Conversion

If the rhythm converts with adenosine, it is probable reentry SVT. Observe patients for recurrence, and treat any recurrence with adenosine or longer-acting AV nodal blocking agents, such as the non-dihydropyridine calcium channel blockers (verapamil and diltiazem) or β-blockers. Typically, you should obtain expert consultation if the tachycardia recurs.

If the rhythm does not convert with adenosine, it is possibly due to atrial flutter, ectopic atrial tachycardia, sinus tachycardia, or junctional tachycardia and you should obtain expert consultation about diagnosis and treatment.

What to Avoid With AV Nodal Blocking Agents

Do not use AV nodal blocking drugs for pre-excited atrial fibrillation or flutter because these drugs are unlikely to slow the ventricular rate and may even accelerate the ventricular response.

Also, **be careful when combining AV nodal blocking agents of varying duration** , such as calcium channel blockers or β-blockers, because their actions may overlap if given serially and provoke profound bradycardia

I KNEW | GOT IT NOW | THINK I GOT IT | I DON'T GET IT

CHALLENGE US

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

66% PROGRESS: HeartCode ACLS 2025

~3h 38m left

Ahmed Othman A

Coach

Push ▶ for reading content aloud.

What is the recommended **initial therapy** for a patient with **stable narrow-complex tachycardia**, after establishing an **IV** and acquiring a **12-lead ECG**?

CHOOSE THE CORRECT ANSWER

- Cardioversion
- β-Blockers
- ✓ Adenosine
- Vagal maneuvers

I KNOW IT | THINK I KNOW IT | NOT SURE | NO IDEA

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

66% PROGRESS: HeartCode ACLS 2025

~3h 38m left

Ahmed Othman A

Coach

Maybe this can help you?

Vagal Maneuvers and A...

What is the recommended **initial therapy** for a patient with **stable narrow-complex tachycardia**, after establishing an **IV** and acquiring a **12-lead ECG**?

Not there yet...

Your Answer | Adenosine

Correct Answer | Vagal maneuvers

Learn more here: Vagal Maneuvers and Adenosine

I Know It

CHALLENGE US

NEXT

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

Push ▶ for reading content aloud.

What **procedure** used in the management of **stable narrow-complex tachycardia** forces a patient to **strain against a closed glottis?**

CHOOSE THE CORRECT ANSWER

- ✓ Valsalva maneuver
- Carotid sinus massage
- Sellick maneuver
- Müller maneuver

I KNOW IT | THINK I KNOW IT | NOT SURE | NO IDEA

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

Coach

Learn more here:

Vagal Maneuvers and A...

What **procedure** used in the management of **stable narrow-complex tachycardia** forces a patient to **strain against a closed glottis?**

You got it!

Your Answer | **Valsalva maneuver**

I Know It

CHALLENGE US

NEXT

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

Coach

Push ▶ for reading content aloud.

What is the recommended initial dose of **adenosine** for the management of **supraventricular tachycardia unresponsive** to **vagal maneuvers?**

CHOOSE THE CORRECT ANSWER

- ✓ 6 mg IV
- 12 mg IV
- 3 mg IV
- 9 mg IV

I KNOW IT | THINK I KNOW IT | NOT SURE | NO IDEA

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

Learn more here:

Vagal Maneuvers and A...

What is the recommended initial dose of **adenosine** for the management of **supraventricular tachycardia unresponsive** to **vagal maneuvers?**

You got it!

Your Answer | 6 mg IV

I Know It

CHALNGE US

NEXT

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

Push ▶ for reading content aloud.

What is the recommended **follow-up dose** of **adenosine** for the management of **supraventricular tachycardia unresponsive** to the **first adenosine dose?**

CHOOSE THE CORRECT ANSWER

6 mg IV

✓ 12 mg IV

3 mg IV

9 mg IV

I KNOW IT | THINK I KNOW IT | NOT SURE | NO IDEA

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

Learn more here:

Vagal Maneuvers and A...

What is the recommended **follow-up dose** of **adenosine** for the management of **supraventricular tachycardia unresponsive** to the **first adenosine dose?**

You got it!

Your Answer | 12 mg IV

I Know It

CHALLENGE US

NEXT

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

Coach

Push ▶ for reading content aloud.

- A patient **without dyspnea** has signs of **acute coronary syndromes.**
- There are **no obvious signs of heart failure.**
- You assess a noninvasively monitored **oxyhemoglobin saturation.**

What is the **oxygen saturation threshold** below which **supplemental oxygen** would be required?

CHOOSE THE CORRECT ANSWER

92%

91%

93%

✓ 90%

I KNOW IT | THINK I KNOW IT | NOT SURE | NO IDEA

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

Learn more here:

Administering Oxygen

- A patient **without dyspnea** has signs of **acute coronary syndromes.**
- There are **no obvious signs of heart failure.**
- You assess a noninvasively monitored **oxyhemoglobin saturation.**

What is the **oxygen saturation threshold** below which **supplemental oxygen** would be required?

You got it!

Your Answer | 90%

I Know It

CHALLENGE US

NEXT

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

Push ▶ for reading content aloud.

ELECTRICAL CARDIOVERSION

Indications for Cardioversion

Rapidly identifying symptomatic tachycardia will help you determine whether to prepare for immediate cardioversion.

- **At heart rates greater than 150/min**, symptoms are often present and cardioversion is often required in unstable patients.
- **If the patient is seriously ill or has underlying cardiovascular disease**, symptoms may be present at lower rates.

You must know when cardioversion is indicated, how to prepare the patient for it (including appropriate medication), and how to switch the defibrillator/monitor to operate as a cardioverter.

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

Push ▶ for reading content aloud.

ELECTRICAL CARDIOVERSION

Perform Immediate Synchronized Cardioversion

- If possible, **establish IV access before cardioversion** and **administer sedation** if the patient is conscious.
- **Do not delay cardioversion** if the patient is extremely unstable.

If the patient with a regular narrow-complex SVT or a monomorphic wide-complex tachycardia is not hypotensive, healthcare providers may administer adenosine 6 mg IV (follow with saline flush) while preparing for synchronized cardioversion.

If cardiac arrest occurs, see the Cardiac Arrest Algorithm.

PREVIOUS 1 2 3 NEXT

CHALLENGE US

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

Push ▶ for reading content aloud.

ELECTRICAL CARDIOVERSION

Unsynchronized vs Synchronized Shocks

Modern defibrillators and cardioverters can deliver unsynchronized or synchronized shocks.

An **unsynchronized shock** means that the **electrical shock is delivered as soon as you push the shock button** on the device. These shocks may fall randomly anywhere within the cardiac cycle and use higher energy levels than synchronized shocks.

Synchronized cardioversion uses a sensor to deliver a shock that is synchronized with a peak of the QRS complex. When you engage the sync option, pressing the shock button can result in a delay before shocking because the device synchronizes the shock to the peak of the R wave, and this may require analysis of several complexes. **Synchronization avoids delivering a shock during cardiac repolarization** (represented on the surface ECG as the **T wave**), a period of vulnerability in which a shock can precipitate VF. Synchronized shocks also use a lower energy level than attempted defibrillation. Always deliver synchronized shocks in patients with a pulse unless there is polymorphic VT, synchronization is impossible, or there is a delay to treatment in the unstable patient.

PREVIOUS 1 2 3

I KNEW | GOT IT NOW | THINK I GOT IT | I DON'T GET IT

CHALLENGE US

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

Push ▶ for reading content aloud.

What is the **lower heart rate limit** for a patient with **sinus tachycardia?**

CHOOSE THE CORRECT ANSWER

- 130/min
- 150/min
- 120/min
- 100/min

I KNOW IT | THINK I KNOW IT | NOT SURE | NO IDEA

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

LTI does not have a session time

Coach

Push ▶ for reading content aloud.

What is the **lower heart rate limit** for a patient with **sinus tachycardia?**

CHOOSE THE CORRECT ANSWER

130/min

150/min

120/min

✓ 100/min

I KNOW IT | THINK I KNOW IT | NOT SURE | NO IDEA

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

Learn more here:

Sinus Tachycardia

What is the **lower heart rate limit** for a patient with **sinus tachycardia?**

You got it!

Your Answer | 100/min

I Know It

CHALLENGE US

NEXT

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

Push ▶ for reading content aloud.

If the patient is conscious, establish IV access **prior to synchronized cardioversion** and administer sedation .

You got it!

I Know It

CHALLENGE US

NEXT

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

Coach

Learn more here:

Electrical Cardioversion

Generally speaking, electrical cardioversion is not recommended as the initial therapy for patients unless the **heart rate is above** 150/min .

You got it!

I Know It

CHALLENGE US

NEXT

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

Coach

Push ▶ for reading content aloud.

ELECTRICAL CARDIOVERSION STEPS

Electrical Cardioversion Steps

Follow these steps to perform synchronized cardioversion, modifying the steps for your specific device.

1 **Sedate** all conscious patients unless unstable or deteriorating rapidly.

2 **Turn on the defibrillator** (monophasic or biphasic).

3 **Attach monitor leads** to the patient and ensure proper display of the patient's rhythm. Position **adhesive electrode (conductor) pads** on the patient.

4 **Press the sync control button** to engage the synchronization mode.

5 **Look for markers on the R wave** indicating sync mode.

6 **Adjust monitor gain** if necessary until sync markers occur with each R wave.

7 **Select the appropriate energy level**. Deliver synchronized shocks according to device's recommended energy level to maximize first shock success.

8 Announce to team members: "**Charging defibrillator—stand clear**!"

9 **Press the charge button**.

10 **Clear the patient** when the defibrillator is charged.

11 **Press the shock button(s)**.

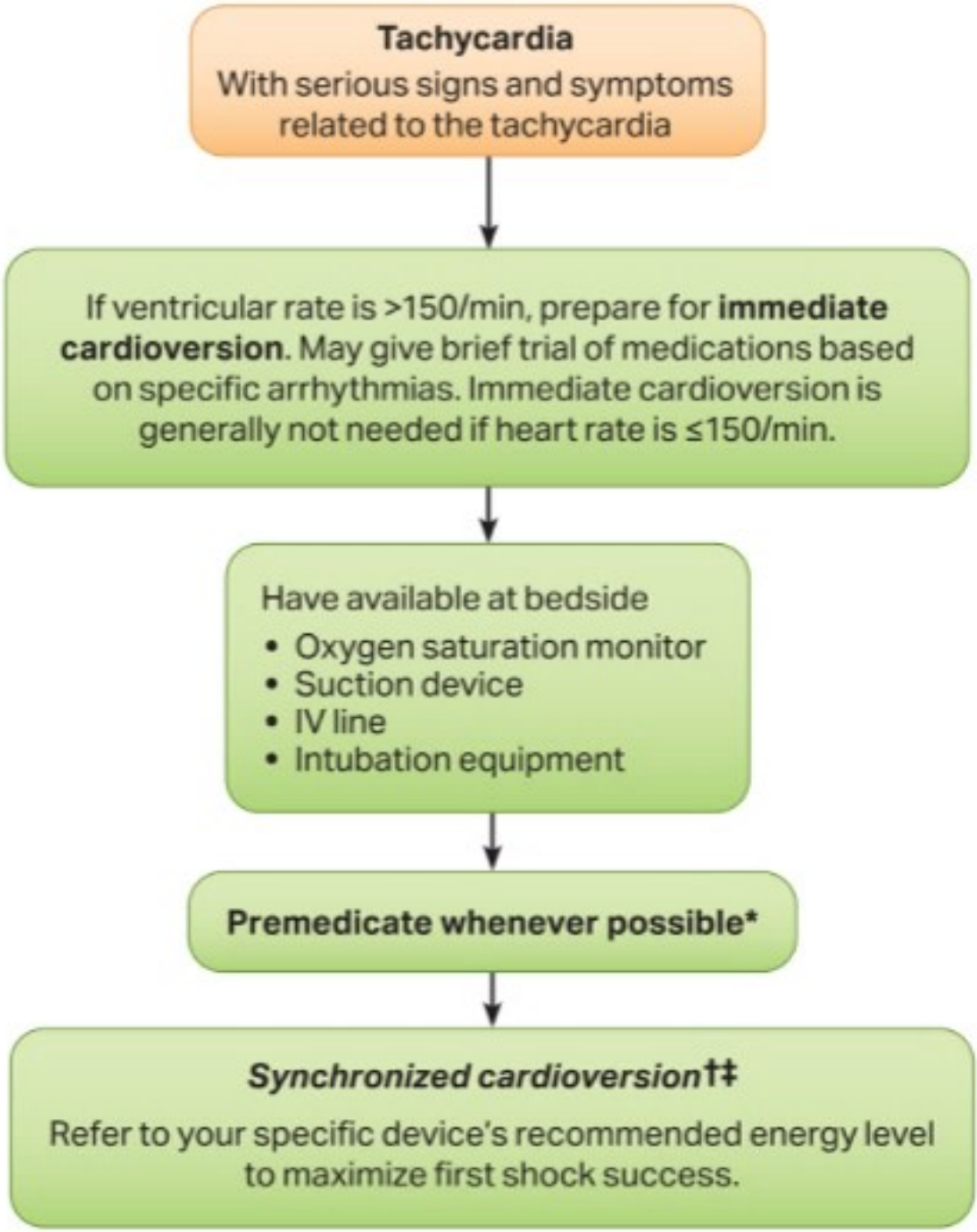
12 **Check the monitor**. If tachycardia persists, increase the energy level (joules) according to the **device manufacturer's recommendations**.

13 **Activate the sync mode after delivery of each synchronized shock**. Most defibrillators default back to the unsynchronized mode after delivery of a synchronized shock. This default allows an immediate shock if cardioversion produces VF.

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

Electrical Cardioversion Algorithm



Notes

*Effective regimens have included a sedative **(eg, diazepam, midazolam, etomidate, methohexital, propofol)** with or without an analgesic agent **(eg, fentanyl, morphine)**. Many experts recommend anesthesia if service is readily available.

†Note possible need to resynchronize after each cardioversion.

‡If delays in synchronization occur and clinical condition is critical, go immediately to unsynchronized shocks.

Coach

Push ▶ for reading content aloud.

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

You are preparing to provide **electrical cardioversion.**

You are monitoring the patient's **ECG** and have applied the **defibrillation** pads to the patient's bare chest. You have delivered sufficient **sedation** and have turned the **defibrillator on.**

What is the **next step** you should perform?

CHOOSE THE CORRECT ANSWER

Press the shock button

Press the charge button

✓ Activate the sync control button

Announce, "Charging defibrillator—stand clear!"

I KNOW IT | THINK I KNOW IT | NOT SURE | NO IDEA

Coach

Learn more here:

Electrical Cardioversion...

You are preparing to provide **electrical cardioversion.**

You are monitoring the patient's **ECG** and have applied the **defibrillation** pads to the patient's bare chest. You have delivered sufficient **sedation** and have turned the **defibrillator on.**

What is the **next step** you should perform?

You got it!

Your Answer | Activate the sync control button

I Know It

CHALLENGE US

NEXT

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

Push ▶ for reading content aloud.

DOSAGE FOR ANTIARRHYTHMIC INFUSIONS

How to Administer

Recent evidence suggests that if the rhythm etiology cannot be determined but is monomorphic with a regular rate, IV adenosine is relatively safe for both treatment and diagnosis. IV antiarrhythmic drugs may be effective. The AHA recommends the following:

- **Procainamide 20 to 50 mg/min IV** until arrhythmia suppressed, hypotension ensues, QRS duration increases more than 50%, or maximum dose 17 mg/kg IV is given. Maintenance infusion: 1 to 4 mg/min IV. Avoid if prolonged QT or congestive heart failure.
- **Amiodarone (first dose) 150 mg IV over 10 minutes**. Repeat as needed if VT recurs. Follow by maintenance infusion of 1 mg/min IV for first 6 hours.
- **Sotalol 100 mg (1.5 mg/kg) IV over 5 minutes**. Avoid if prolonged QT.

In the case of irregular wide-complex tachycardia, management focuses on control of the rapid ventricular rate (rate control), conversion of hemodynamically unstable atrial fibrillation to sinus rhythm (rhythm control), or both. Seek expert consultation.

I KNEW | GOT IT NOW | THINK I GOT IT | I DON'T GET IT

CHALLENGE US

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

Push ▶ for reading content aloud.

Which is a **contraindication** to the use of **procainamide infusion** in the management of **stable wide-complex tachycardia?**

CHOOSE THE CORRECT ANSWER

- Asthma
- Type 2 diabetes
- Impaired renal function
- ✓ Prolonged QT interval

I KNOW IT | THINK I KNOW IT | NOT SURE | NO IDEA

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

Learn more here:

Dosage for Antiarrhyth...

Which is a **contraindication** to the use of **procainamide infusion** in the management of **stable wide-complex tachycardia?**

You got it!

Your Answer | **Prolonged QT interval**

I Know It

CHALLENGE US

NEXT

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

Push ▶ for reading content aloud.

What is the recommended **first dose** of **amiodarone** for the management of **stable wide-complex tachycardia?**

CHOOSE THE CORRECT ANSWER

2 to 4 mg/kg IV

✓ 150 mg IV

300 mg IV

100 mg IV

I KNOW IT | THINK I KNOW IT | NOT SURE | NO IDEA

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

71% PROGRESS: HeartCode ACLS 2025

~3h 19m left

Ahmed Othman A

Coach

Learn more here:

Dosage for Antiarrhyth...

What is the recommended **first dose of amiodarone** for the management of **stable wide-complex tachycardia**?

You got it!

Your Answer | 150 mg IV

I Know It

CHALLENGE US

NEXT

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

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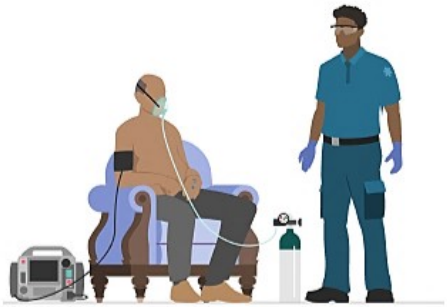


Introduction

A 72-year-old male patient has been suffering from progressive dizziness and bouts of palpitations after exercising last night. His symptoms reappeared and worsened this morning.

CHALLENGE US NEXT

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

Push ▶ for reading content aloud.

The patient is conscious and alert, has an **HR** of 180/min, a weak radial pulse, **BP** 110/78 mm Hg, and **SpO_2** of 96%.

What are the most appropriate initial interventions?

Select all that apply.

SELECT ALL THAT APPLY

- [ ] Administer epinephrine
- [x] Attach a 12-lead ECG
- [x] Maintain a patent airway and monitor
- [ ] Administer adenosine

I KNOW IT | THINK I KNOW IT | NOT SURE | NO IDEA

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

Push ▶ for reading content aloud.

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

What rhythm is shown on the monitor?

CHOOSE THE CORRECT ANSWER

- ✓ Supraventricular tachycardia
- Sinus rhythm
- Ventricular fibrillation
- Ventricular tachycardia

I KNOW IT | THINK I KNOW IT | NOT SURE | NO IDEA

Coach

Push ▶ for reading content aloud.

What do your next steps include?

SELECT ALL THAT APPLY

- [ ] Synchronized cardioversion
- [x] 12-lead ECG
- [ ] Administer amiodarone
- [x] IV access
- [x] Vagal maneuvers

I KNOW IT | THINK I KNOW IT | NOT SURE | NO IDEA

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

Push ▶ for reading content aloud.

Vagal maneuvers are unsuccessful.

His vital signs are **HR** 178/min, **RR** 24/min, and **BP** 110/78 mm Hg.

What medication is appropriate for this patient?

CHOOSE THE CORRECT ANSWER

Atropine 0.5 mg IV push

Adenosine 18 mg IV (follow with saline flush)

✓ Adenosine 6 mg IV (follow with saline flush)

Epinephrine 1 mg IV push

I KNOW IT | THINK I KNOW IT | NOT SURE | NO IDEA

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

Push ▶ for reading content aloud.

After administration of adenosine, the patient's vital signs are now **HR** 184/min, **RR** 26/min, and **BP** 78/54 mm Hg. He now responds only to noxious stimuli.

What is your next action?

CHOOSE THE CORRECT ANSWER

- Begin chest compressions
- Provide immediate defibrillation
- Administer 18 mg of adenosine
- ✓ Perform synchronized cardioversion

I KNOW IT | THINK I KNOW IT | NOT SURE | NO IDEA

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

71% PROGRESS: HeartCode ACLS 2025

~3h 19m left

Ahmed Othman A

Coach

Push ▶ for reading content aloud.

1 2 3 4 5 6 7 8

Your score is: 100 %

Congratulations! You successfully completed steps of the **Adult Tachycardia With a Pulse Algorithm**.

Select **NEXT** to continue with the program.
If you wish to review the questions, click on the question numbers above.

Adult Tachycardia With a Pulse Algorithm

Provider Manual

CHALLENGE US NEXT

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

Push ▶ for reading content aloud.

ADULT CARDIAC ARREST INTRODUCTION

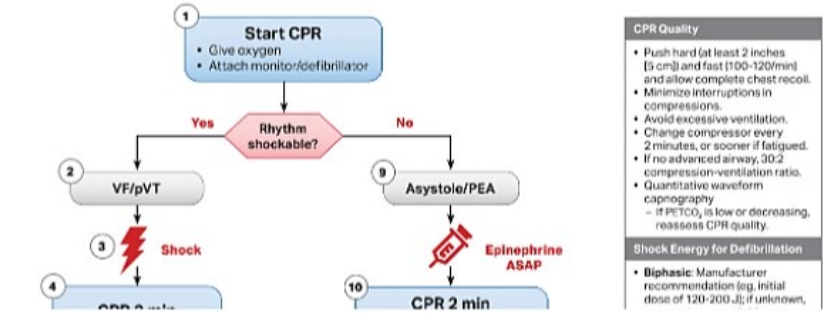
Adult Cardiac Arrest Algorithm

The most important algorithm for adult resuscitation is the **Adult Cardiac Arrest Algorithm**. This algorithm outlines all the steps to assess and manage a pulseless patient who does not initially respond to BLS interventions, including a first shock from an AED. The algorithm consists of the 2 pathways for cardiac arrest:

- **A shockable rhythm**, displayed on the VF/pulseless VT (pVT) pathway of the algorithm
- **A nonshockable rhythm**, displayed on the asystole/pulseless electrical activity (PEA) pathway of the algorithm

Because many patients with sudden cardiac arrest demonstrate VF at some point in their arrest, most ACLS providers will often follow the VF/pVT path of the Cardiac Arrest Algorithm. Rapidly treating VF according to this sequence is the best approach to restoring spontaneous circulation. The algorithm includes pVT because it is treated as VF. **VF and pVT require CPR until a defibrillator is available to deliver high-energy unsynchronized shocks.**

Adult Cardiac Arrest Algorithm (VF/pVT/Asystole/PEA)



1 2 NEXT

CHALLENGE US

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

Push ▶ for reading content aloud.

ADULT CARDIAC ARREST INTRODUCTION

Shockable Rhythms on ECG

Monomorphic ventricular tachycardia

Polymorphic ventricular tachycardia

PREVIOUS 1 2

I KNEW | GOT IT NOW | THINK I GOT IT | I DON'T GET IT

CHALLENGE US

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

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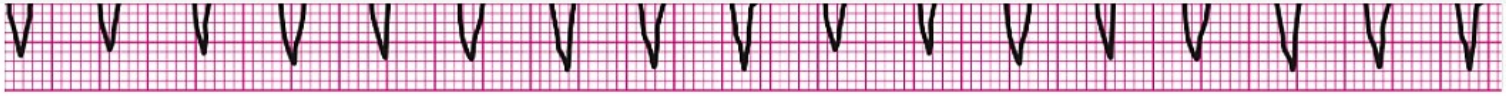
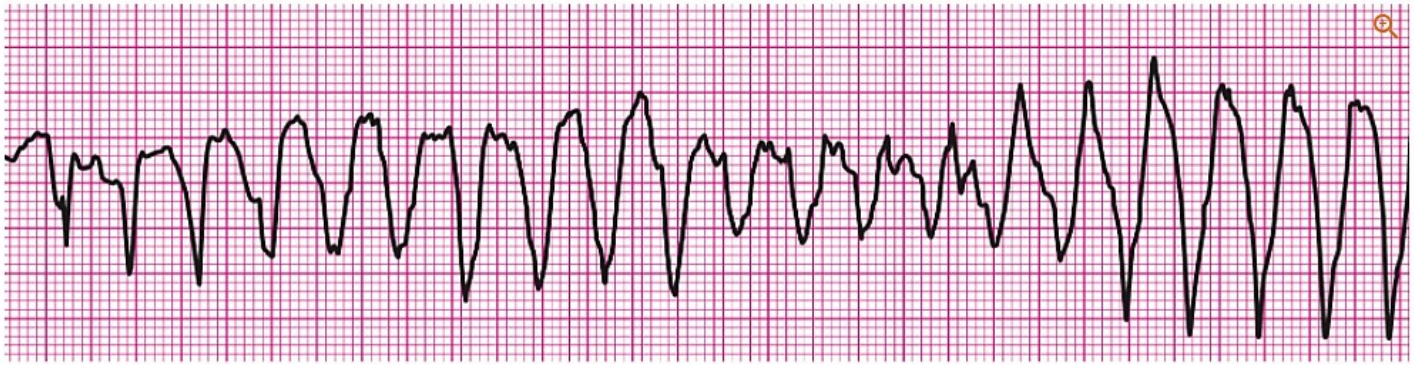
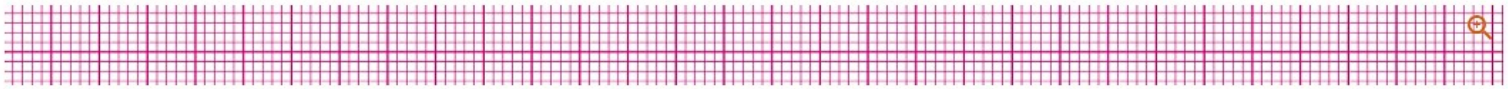
ADULT CARDIAC ARREST INTRODUCTION



Polymorphic ventricular tachycardia



VF



PREVIOUS 1 2

I KNEW | GOT IT NOW | THINK I GOT IT | I DON'T GET IT

CHALLENGE US

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

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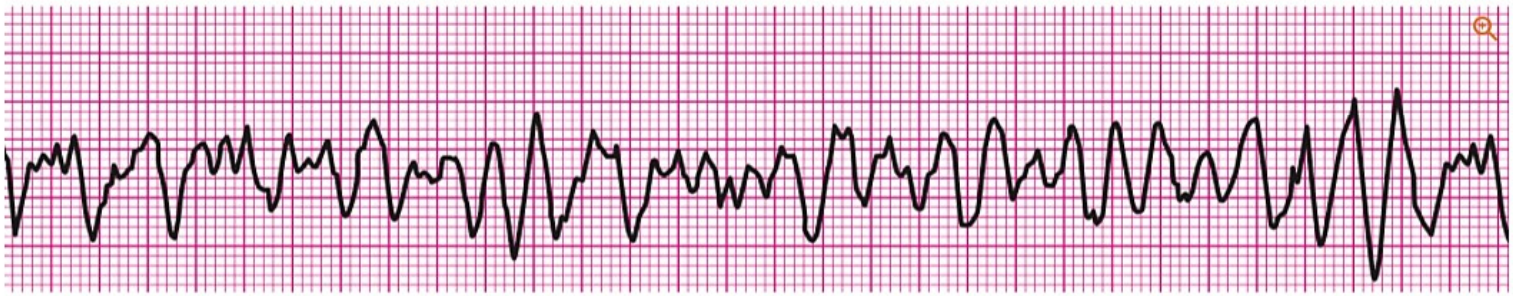
ADULT CARDIAC ARREST INTRODUCTION

VF



PREVIOUS 1 2

I KNEW | GOT IT NOW | THINK I GOT IT | I DON'T GET IT

CHALLENGE US

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

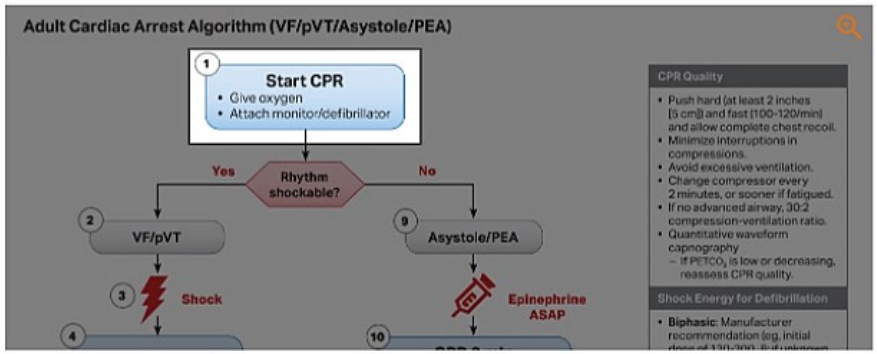
Push ▶ for reading content aloud.

MANAGEMENT OF VF/PVT

Applying the Adult Cardiac Arrest Algorithm: VF/pVT Pathway

For the Adult Cardiac Arrest Algorithm, healthcare providers should have already completed the BLS Assessment, including activating the emergency response system, performing CPR, attaching the manual defibrillator, and delivering the first shock. Now, the ACLS high-performance team intervenes and conducts the Primary Assessment. The team assesses the patient and takes actions as needed.

The Team Leader coordinates the efforts of the high-performance team as they complete the steps listed in the VF/pVT pathway of the Cardiac Arrest Algorithm. A team member should continue to perform high-quality CPR until someone brings the defibrillator and attaches it to the patient. The Team Leader assigns roles and responsibilities and organizes interventions to **minimize interruptions in chest compressions**. This accomplishes the most critical interventions for VF or pVT: CPR with minimal interruptions in chest compressions and defibrillation during the first minutes of arrest.



1 2 3 4 5 NEXT

CHALLENGE US

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

Push ▶ for reading content aloud.

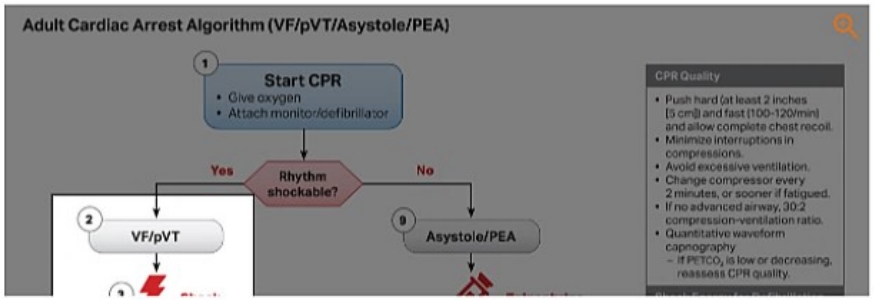
MANAGEMENT OF VF/PVT

Defibrillate

As soon as you determine that the rhythm is VF or VT, deliver 1 shock. The appropriate energy dose is determined by the identity of the defibrillator—monophasic or biphasic.

Resume CPR

- **Immediately resume CPR, beginning with chest compressions.**
- Do not perform a rhythm or pulse check at this point unless the patient is showing signs of life, such as return of spontaneous circulation (ROSC).
- Establish IV/IO access.



PREVIOUS 1 2 3 4 5 NEXT

CHALLENGE US

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

Push ▶ for reading content aloud.

MANAGEMENT OF VF/PVT

Perform a Rhythm Check

Check the rhythm after 2 minutes of CPR, but be careful to minimize interruptions in chest compressions. **Do not exceed 10 seconds for the pause in chest compressions to check the rhythm.**

- **If the rhythm is nonshockable and organized**, try to find a pulse. If you have any doubt about the presence of a pulse, immediately resume CPR. Remember to perform a pulse check—preferably during rhythm analysis—only if an organized rhythm is present.
- **If the rhythm is organized and you can feel a pulse**, proceed to post–cardiac arrest care.
- **If the rhythm is nonshockable and you cannot feel a pulse**, proceed along the asystole/pulseless electrical activity (PEA) pathway of the Cardiac Arrest Algorithm.
- **If the rhythm is shockable**, give 1 shock and immediately resume CPR for 2 minutes after the shock.

When IV/IO access is available, give epinephrine 1 mg IV/IO during CPR after the second shock, and repeat every 3 to 5 minutes, or every 4 minutes as a midrange. If additional team members are available, they should anticipate the need for drugs and prepare them in advance.

No known vasopressor (epinephrine) increases survival from VF/pVT . But because these medications can improve aortic diastolic blood pressure, coronary artery perfusion pressure, and the rate of ROSC, the AHA continues to recommend their use.

Adult Cardiac Arrest Algorithm (VF/pVT/Asystole/PEA)

PREVIOUS 1 2 3 4 5 NEXT

CHALLENGE US

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

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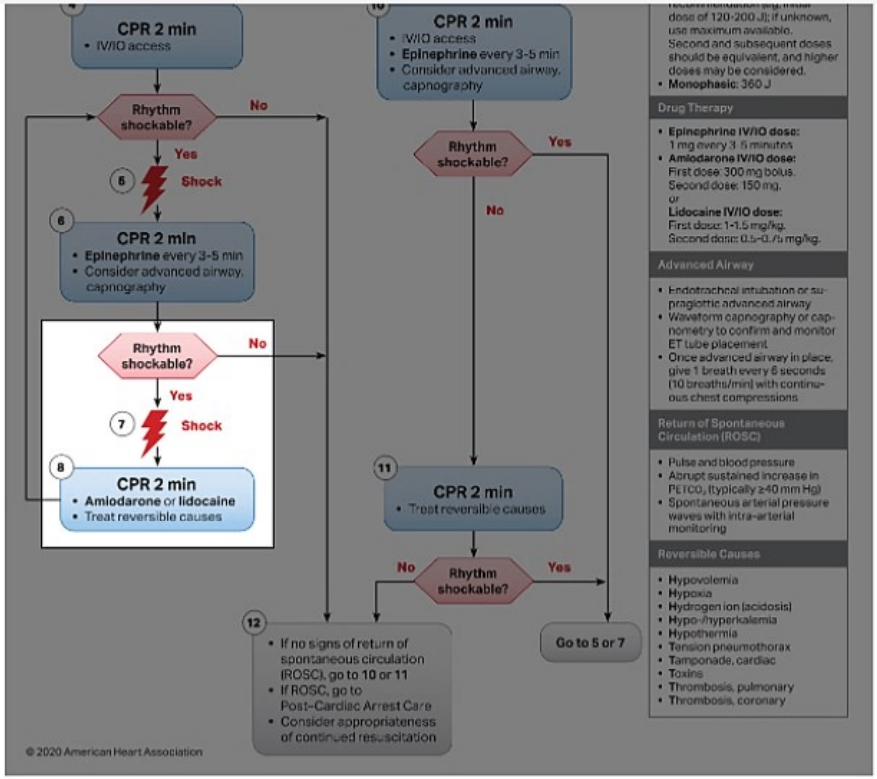
MANAGEMENT OF VF/PVT



PREVIOUS 1 2 3 4 5 NEXT

CHALLENGE US

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

Push ▶ for reading content aloud.

MANAGEMENT OF VF/PVT

Perform a Rhythm Check

After 2 minutes of CPR, conduct a rhythm check, being careful to minimize interruptions in chest compressions.

If a rhythm check reveals a shockable rhythm, resume chest compressions while the defibrillator is charging, and then deliver another shock. Repeat chest compressions each time the defibrillator is charging.

Resume CPR, beginning with chest compressions, for 2 minutes immediately after the shock.

At this point, you may consider giving **amiodarone** or **lidocaine**, antiarrhythmic agents that have been clinically demonstrated to improve the rate of ROSC and hospital admission in adults with refractory VF or pulseless VT.

Amiodarone: 300 mg IV/IO bolus, then consider 1 additional 150 mg IV/IO.

Amiodarone is considered a class III antiarrhythmic drug, but it possesses electrophysiologic characteristics of the other classes. Amiodarone blocks sodium channels at rapid pacing frequencies (class I effect) and exerts a noncompetitive antisympathetic action (class II effect). One of the main effects of prolonged amiodarone administration is lengthening of the cardiac action potential (class III effect).

Lidocaine: 1 to 1.5 mg/kg IV/IO first dose, then 0.5 to 0.75 mg/kg IV/IO at 5- to 10-minute intervals, to a maximum dose of 3 mg/kg.

Lidocaine suppresses automaticity of conduction tissue in the heart by increasing the electrical stimulation threshold of the ventricle, His-Purkinje system, and spontaneous depolarization of the ventricles during diastole by a direct action on the tissues. Lidocaine blocks permeability of the neuronal membrane to sodium ions,

PREVIOUS 2 3 4 5 6 NEXT

CHALLENGE US

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

Push ▶ for reading content aloud.

MANAGEMENT OF VF/PVT

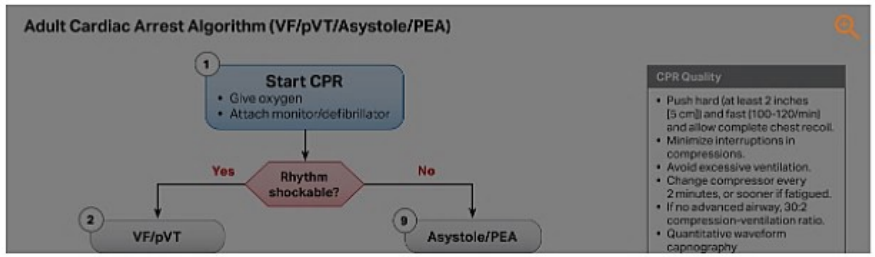
Lidocaine: 1 to 1.5 mg/kg IV/IO first dose, then 0.5 to 0.75 mg/kg IV/IO at 5- to 10-minute intervals, to a maximum dose of 3 mg/kg.

Lidocaine suppresses automaticity of conduction tissue in the heart by increasing the electrical stimulation threshold of the ventricle, His-Purkinje system, and spontaneous depolarization of the ventricles during diastole by a direct action on the tissues. Lidocaine blocks permeability of the neuronal membrane to sodium ions, which inhibits depolarization and the blockade of conduction.

Providers should **consider magnesium sulfate for torsades de pointes associated with a long QT interval**. Magnesium sulfate loading dose 1 to 2 g IV/IO diluted in 10 mL (eg, D_5W, normal saline) given as IV/IO bolus, typically over 20 minutes.

Magnesium can be classified as a sodium/potassium pump agonist. Magnesium has several electrophysiological effects, including suppression of atrial L- and T-type calcium channels, and ventricular after-depolarizations. Routinely administering magnesium sulfate in cardiac arrest is not recommended unless torsades de pointes is present.

After administering amiodarone or lidocaine, check for a shockable rhythm at the 2-minute mark. If one is present, deliver a shock, and work through the sequence again until ROSC is achieved, at which point you'll move on to the **Post–Cardiac Arrest Care Algorithm**.



CHALLENGE US

Self-Assessment

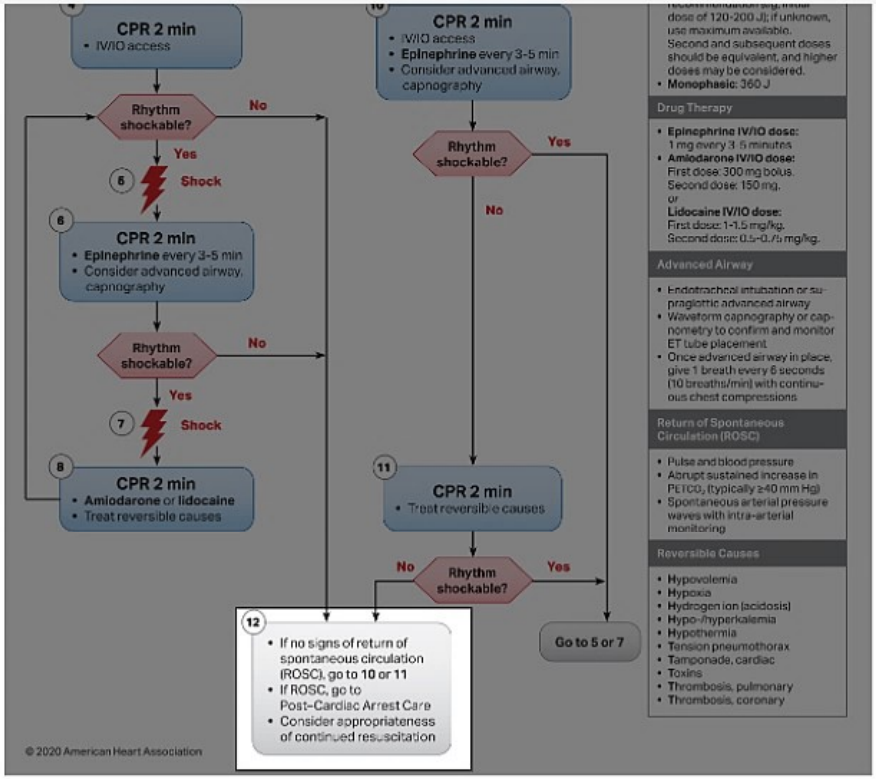
Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

Push ▶ for reading content aloud.

MANAGEMENT OF VF/PVT



PREVIOUS 2 3 4 5 6 NEXT

CHALLENGE US

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

Push ▶ for reading content aloud.

MANAGEMENT OF VF/PVT

Ultrasound for VF/pVT/Asystole/PEA

Ultrasound may be applied to patients receiving CPR to help **assess myocardial contractility** and **identify potentially treatable causes of cardiac arrest**, such as hypovolemia, pneumothorax, pulmonary thromboembolism, or pericardial tamponade. However, it is unclear whether routinely using ultrasound among patients experiencing cardiac arrest affects important clinical outcomes. If a qualified sonographer is present and use of ultrasound does not interfere with the standard cardiac arrest treatment protocol, then consider ultrasound as an adjunct to standard patient evaluation.

Transporting Patients in Cardiac Arrest

Emergency medical response systems should not require field personnel to transport every cardiac arrest patient to a hospital or an emergency department. However, transportation with continuing CPR is justified if personnel cannot perform interventions out-of-hospital that are available in the hospital and are needed for special circumstances (ie, cardiopulmonary bypass or extracorporeal circulation for patients with severe hypothermia).

After out-of-hospital cardiac arrest (OHCA) with ROSC, transport the patient to an appropriate hospital with a comprehensive post–cardiac arrest treatment system of care that includes acute coronary interventions, neurologic care, critical care, and hypothermia. Transport in-hospital post–cardiac arrest patients to an appropriate critical care unit that can provide comprehensive post–cardiac arrest care.

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

I KNEW | GOT IT NOW | THINK I GOT IT | I DON'T GET IT

CHALLENGE US

Coach

Push ▶ for reading content aloud.

In addition to CPR with minimal interruptions in chest compressions, what is the most **critical intervention** during the **first few minutes** of arrest for a patient in **ventricular fibrillation?**

CHOOSE THE CORRECT ANSWER

- Administering epinephrine
- Advanced airway insertion
- Establishing an IV
- ✓ Defibrillation

I KNOW IT | THINK I KNOW IT | NOT SURE | NO IDEA

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

72% PROGRESS: HeartCode ACLS 2025

~3h 19m left

Ahmed Othman A

Coach

Learn more here:

Management of VF/pVT

In addition to CPR with minimal interruptions in chest compressions, what is the most **critical intervention** during the **first few minutes** of arrest for a patient in **ventricular fibrillation?**

You got it!

Your Answer | **Defibrillation**

I Know It

CHALLENGE US

NEXT

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

Push ▶ for reading content aloud.

During the management of a patient in cardiac arrest, you have initiated CPR, attached the manual defibrillator, delivered the first shock, and immediately resumed high-quality CPR, beginning with chest compressions.

What is your next intervention?

CHOOSE THE CORRECT ANSWER

- Deliver a second shock
- ✓ Establish IV or IO access
- Administer epinephrine
- Insert an advanced airway

I KNOW IT | THINK I KNOW IT | NOT SURE | NO IDEA

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

Learn more here:

Management of VF/pVT

During the management of a patient in cardiac arrest, you have initiated CPR, attached the manual defibrillator, delivered the first shock, and immediately resumed high-quality CPR, beginning with chest compressions.

What is your next intervention?

You got it!

Your Answer | Establish IV or IO access

I Know It

CHALLENGE US

NEXT

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

Push ▶ for reading content aloud.

When is the recommended point to administer the **first dose of epinephrine** for a patient in a **shockable rhythm**?

CHOOSE THE CORRECT ANSWER

- ✓ Between the second and third shocks
- As soon as IV or IO access is established
- Between the first and second shocks
- Between the third and fourth shocks

I KNOW IT | THINK I KNOW IT | NOT SURE | NO IDEA

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

Learn more here:

Management of VF/pVT

When is the recommended point to administer the **first dose of epinephrine** for a patient in a **shockable rhythm**?

You got it!

Your Answer | Between the second and third shocks

I Know It

CHALLENGE US

NEXT

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

74% PROGRESS: HeartCode ACLS 2025

~3h 10m left

Ahmed Othman A

Coach

Push ▶ for reading content aloud.

What is the recommended **dose** for **epinephrine** during a **resuscitation** effort?

CHOOSE THE CORRECT ANSWER

- 3 mg IV every 10 to 12 minutes
- ✓ 1 mg IV every 3 to 5 minutes
- 5 mg IV every 1 to 2 minutes
- 0.1 mg IV every 6 to 8 minutes

I KNOW IT | THINK I KNOW IT | NOT SURE | NO IDEA

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

74% PROGRESS: HeartCode ACLS 2025

~3h 10m left

Ahmed Othman A

Coach

Learn more here:

Management of VF/pVT

What is the recommended **dose** for **epinephrine** during a **resuscitation** effort?

You got it!

Your Answer | 1 mg IV every 3 to 5 minutes

I Know It

CHALNGE US

NEXT

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

Coach

Push ▶ for reading content aloud.

What is the recommended **first IV/IO dose of amiodarone** for patients in cardiac arrest with **VF/pVT** that is **unresponsive to defibrillation**?

CHOOSE THE CORRECT ANSWER

- 200 mg
- ✓ 300 mg
- 150 mg
- 100 mg

I KNOW IT | THINK I KNOW IT | NOT SURE | NO IDEA

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

74% PROGRESS: HeartCode ACLS 2025

~3h 10m left

Ahmed Othman A

Coach

Learn more here:

Management of VF/pVT

What is the recommended **first IV/IO dose of amiodarone** for patients in cardiac arrest with **VF/pVT** that is **unresponsive to defibrillation?**

You got it!

Your Answer | 300 mg

I Know It

CHALLENGE US

NEXT

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

74% PROGRESS: HeartCode ACLS 2025

~3h 10m left

Ahmed Othman A

Coach

Push ▶ for reading content aloud.

What is the recommended **first IV/IO dose of lidocaine** for patients in cardiac arrest with **VF/pVT** that is **unresponsive to defibrillation?**

CHOOSE THE CORRECT ANSWER

- ✓ 1 to 1.5 mg/kg
- 0.1 to 0.75 mg/kg
- 3 to 3.5 mg/kg
- 2 to 2.5 mg/kg

I KNOW IT | THINK I KNOW IT | NOT SURE | NO IDEA

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

74% PROGRESS: HeartCode ACLS 2025

~3h 10m left

Ahmed Othman A

Coach

Learn more here:

Management of VF/pVT

What is the recommended **first IV/IO dose of lidocaine** for patients in cardiac arrest with **VF/pVT** that is **unresponsive to defibrillation?**

You got it!

Your Answer | 1 to 1.5 mg/kg

I Know It

CHALLENGE US

NEXT

Self-Assessment

Adjust your competence estimate to the right to focus on the questions

ADVANCED BEGINNER

PULSELESS ELECTRICAL ACTIVITY

Description of PEA

Pulseless electrical activity (PEA) refers to a situation where the heart generates electrical activity that should correspond to a pulse but no pulse can be palpated. An organized rhythm consists of **QRS complexes that are similar in appearance from beat to beat** (ie, each has a uniform QRS configuration). Organized rhythms may have **narrow or wide QRS complexes**, they may occur at **rapid or slow rates**, they may be **regular or irregular**, and they **may or may not produce a pulse**.

PEA includes

- Idioventricular or ventricular escape rhythms
- Sinus rhythm
- Atrial fibrillation or flutter
- Bundle branch blocks

Any organized rhythm without a pulse is defined as PEA, and **even sinus rhythm without a detectable pulse is called PEA**. Pulseless rhythms that are excluded by definition include VF, pVT, and asystole.

PULSELESS ELECTRICAL ACTIVITY

Identifying and Correcting Underlying Causes

Treating PEA goes beyond the interventions in the algorithm. As you assess the patient, **try to identify evidence of an underlying cause and correct it if present**. Stop, think, and ask, "**Why did this person have this cardiac arrest at this time**?" You must search for and treat reversible causes of PEA for resuscitative efforts to be potentially successful. Use the **H's and T's** to recall conditions that could have contributed to PEA, and remember that **hypovolemia and hypoxia are the 2 most common underlying, potentially reversible causes of PEA**.

I KNEW | GOT IT NOW | THINK I GOT IT | I DON'T GET IT

CHALLENGE US

What term best describes an organized rhythm without a pulse?

CHOOSE THE CORRECT ANSWER

VF

✓ PEA

Asystole

VT

I KNOW IT | THINK I KNOW IT | NOT SURE | NO IDEA

What term best describes an **organized rhythm without a pulse?**

You got it!

Your Answer | **PEA**

I Know It

CHALLENGE US

NEXT

PEA can present as which of the following organized rhythms?

SELECT ALL THAT APPLY

- [x] Sinus rhythm
- [ ] Asystole
- [x] Atrial fibrillation or flutter
- [ ] VF
- [x] Bundle branch blocks

I KNOW IT | THINK I KNOW IT | NOT SURE | NO IDEA

PEA can present as which of the following organized rhythms?

You got it!

- Your Answer | Sinus rhythm
- Your Answer | Atrial fibrillation or flutter
- Your Answer | Bundle branch blocks

I Know It

CHALLENGE US

NEXT

MANAGEMENT OF ASYSTOLE/PEA

Applying the Adult Cardiac Arrest Algorithm: Asystole/PEA Pathway

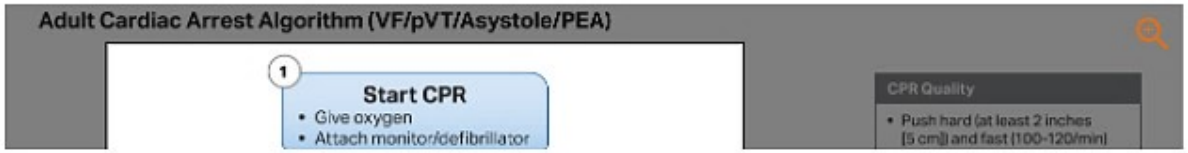
When the patient is in cardiac arrest, high-performance team members initiate and perform high-quality CPR throughout the BLS, Primary, and Secondary Assessments. The team interrupts CPR for 10 seconds or less for rhythm and pulse checks.

If the patient has an organized rhythm on the monitor but no pulse, the condition is PEA. You will need to recognize asystole and slow PEA terminating in bradyasystolic rhythm.

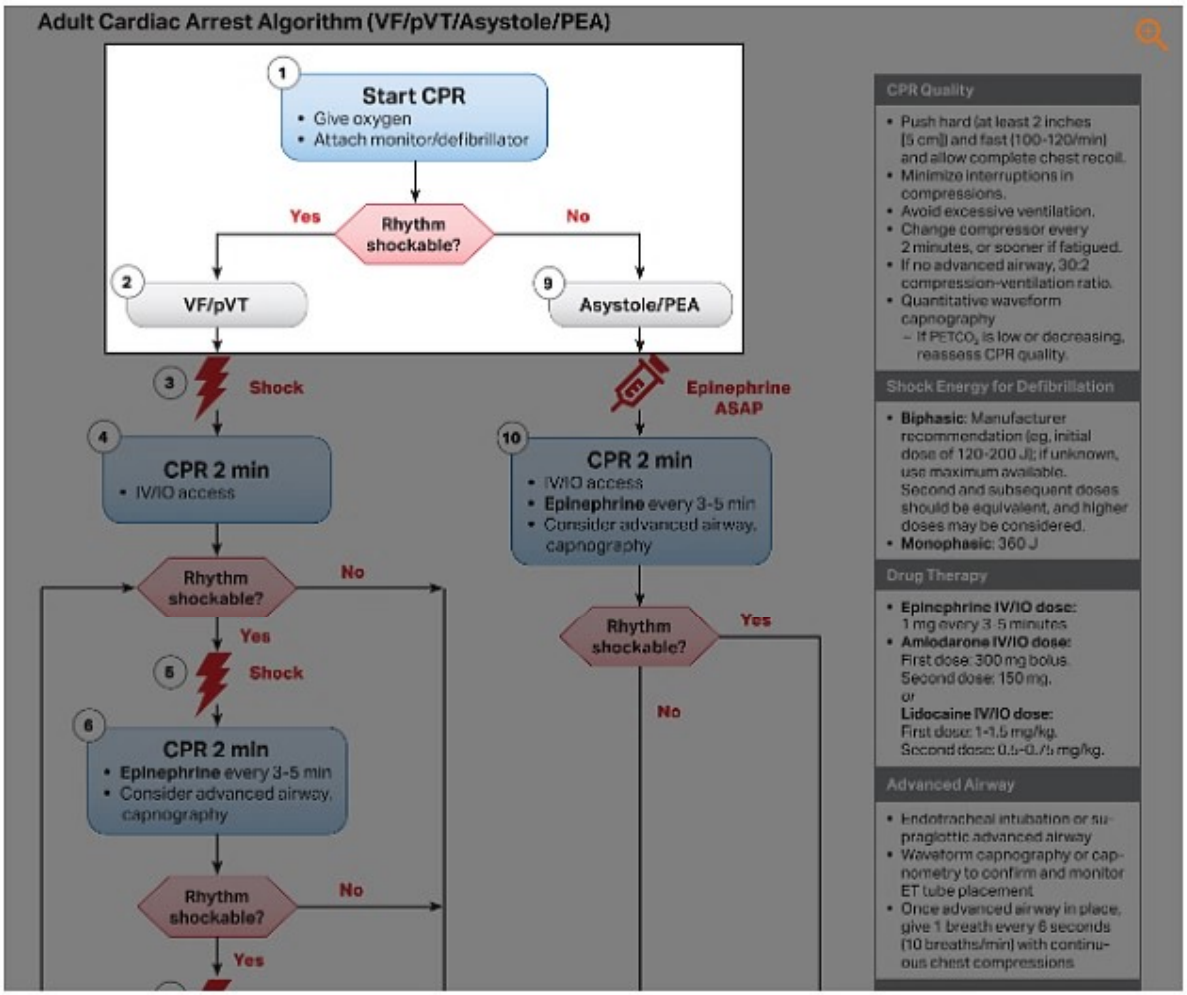
Asystole is a cardiac arrest rhythm associated with no discernible electrical activity on the ECG (also called **flat line**). You should confirm that the flat line on the monitor is indeed "true asystole" by validating that the flat line is

- Not another rhythm (eg, fine VF) masquerading as a flat line
- Not the result of an artifact associated with a disconnected lead or incorrect lead setting (eg, lead set to pads when they are not on the patient)

For a patient in asystole/PEA, resume chest compressions immediately. Prioritize establishing IV/IO access over managing an advanced airway unless bag-mask ventilation is ineffective or hypoxia caused the arrest.



MANAGEMENT OF ASYSTOLE/PEA



MANAGEMENT OF ASYSTOLE/PEA

Decision Point: Perform a Rhythm Check

Check the rhythm and give 2 minutes of CPR after administering the drugs, but be careful to minimize interruptions in chest compressions.

Do not exceed 10 seconds for the pause in chest compressions to check the rhythm.

Administer Epinephrine

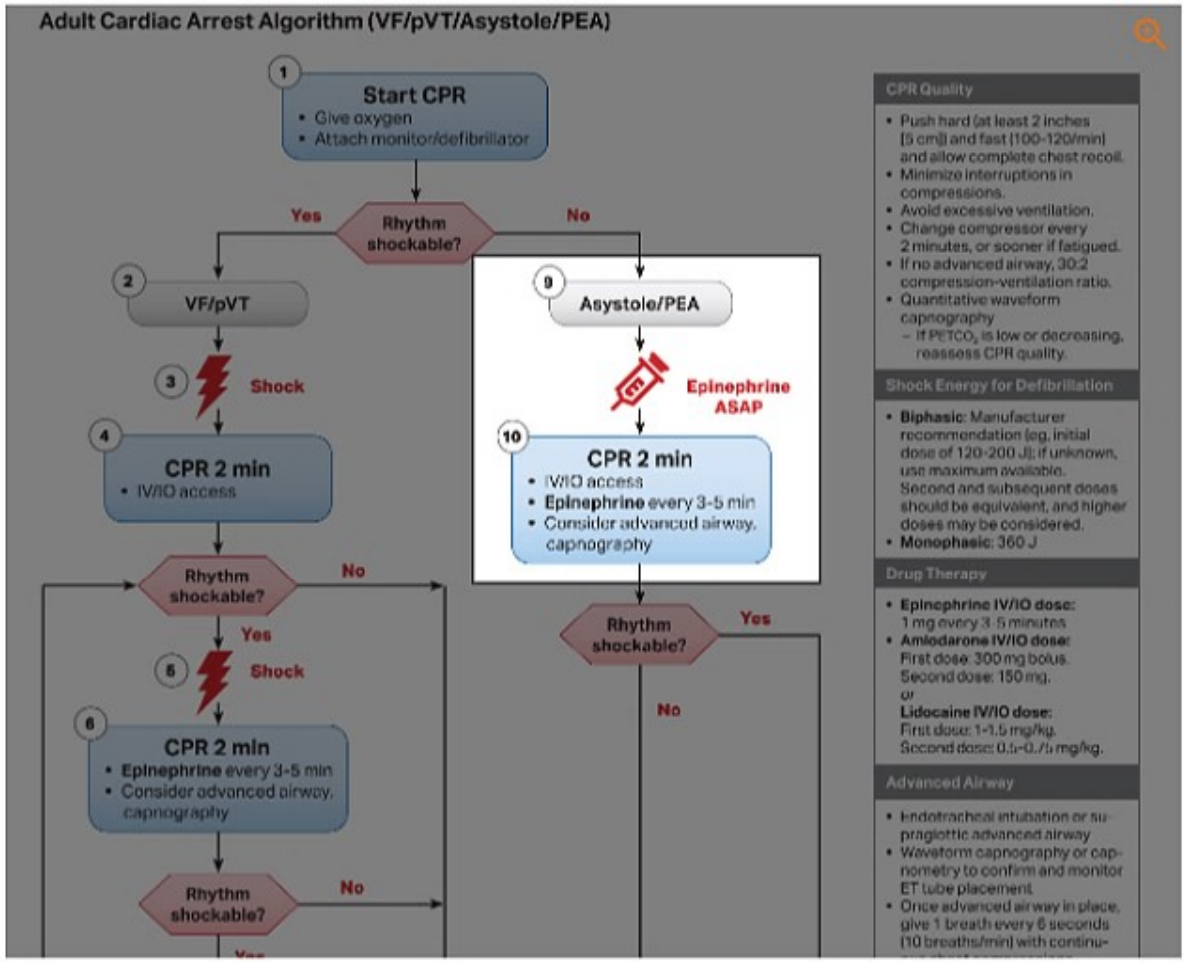
Give epinephrine as soon as IV/IO access becomes available. Epinephrine 1 mg IV/IO—repeat every 3 to 5 minutes or every 4 minutes as a midrange (ie, every other rhythm check)

Administer drugs during CPR. Do not stop CPR to administer drugs.

Consider advanced airway and capnography.

MANAGEMENT OF ASYSTOLE/PEA

Consider advanced airway and capnography.



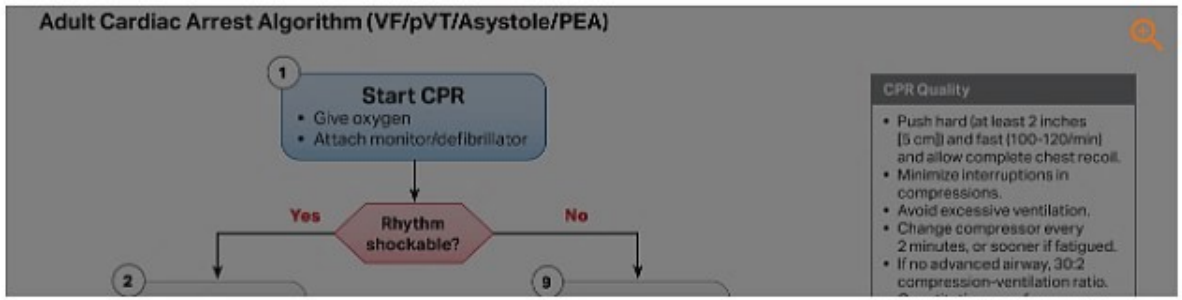
MANAGEMENT OF ASYSTOLE/PEA

Nonshockable Rhythm

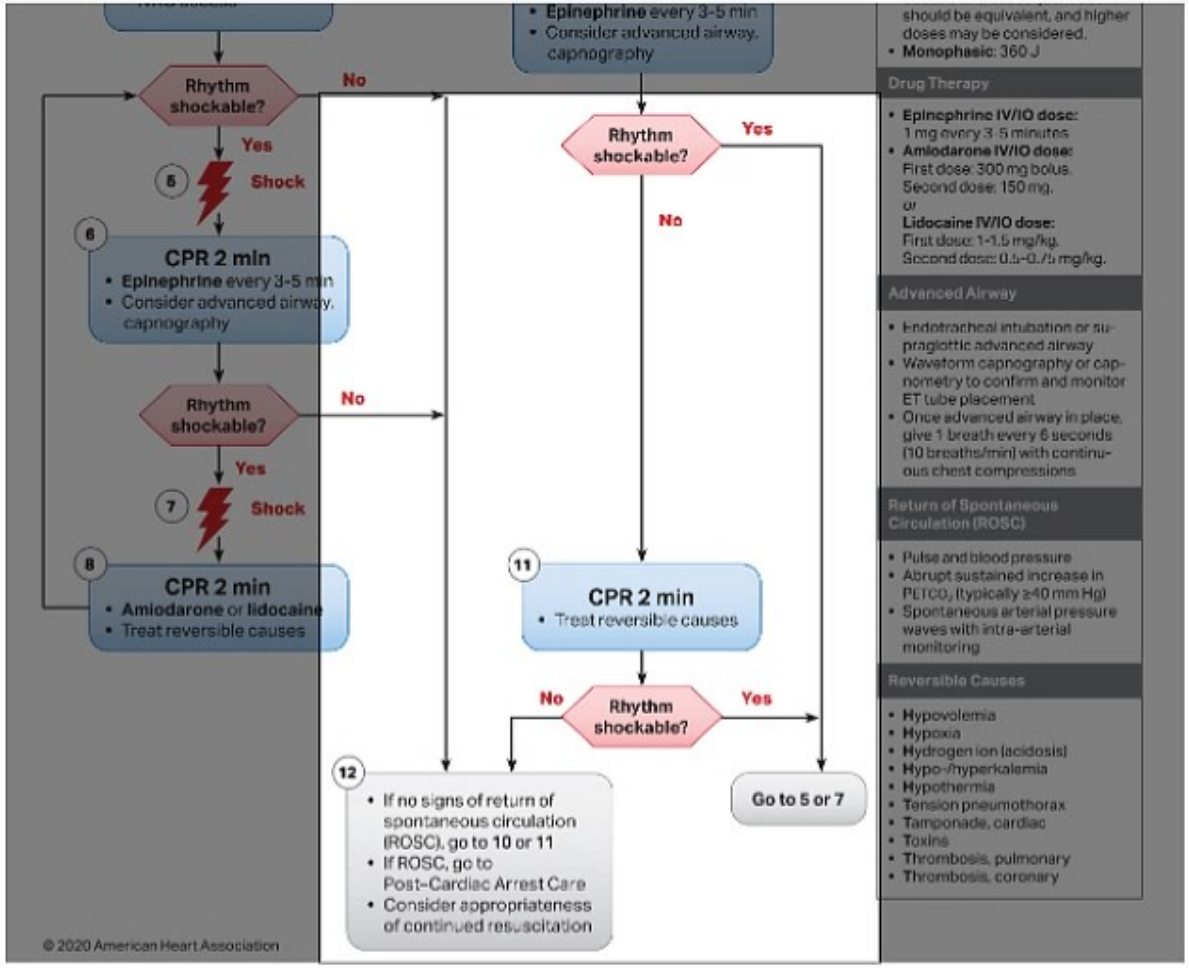
- **If no electrical activity is present** (asystole), repeat the sequence.
- **If organized electrical activity is present**, try to feel for a pulse. Take at least 5 seconds but no more than 10 seconds to check for a pulse.
- **If no pulse is present**, or if you have any doubt about the presence of a pulse, immediately resume CPR for 2 minutes, starting with chest compressions, and then repeat the sequence.
- **If a pulse is present and the rhythm is organized**, begin post–cardiac arrest care.

Decision Point: Shockable Rhythm

- **If the rhythm check reveals a shockable rhythm**, resume CPR with chest compressions while the defibrillator is charging.
- **Switch to the VF/pVT sequence in the algorithm**, starting with a shock.



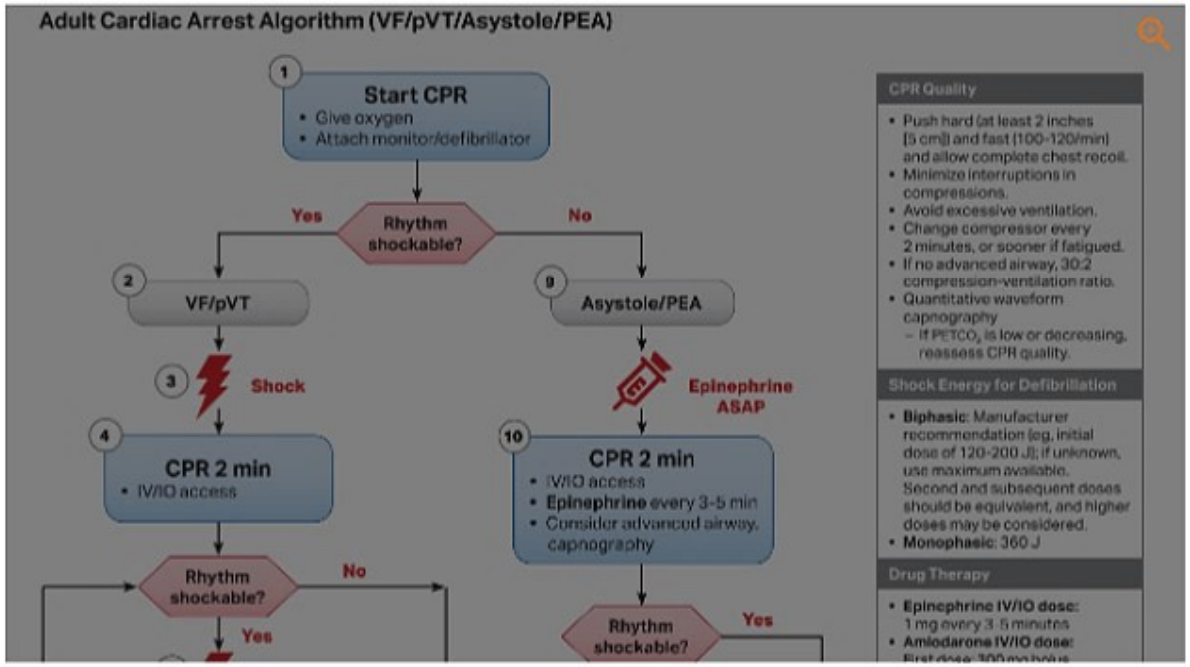
MANAGEMENT OF ASYSTOLE/PEA



MANAGEMENT OF ASYSTOLE/PEA

Identifying and Correcting Underlying Causes

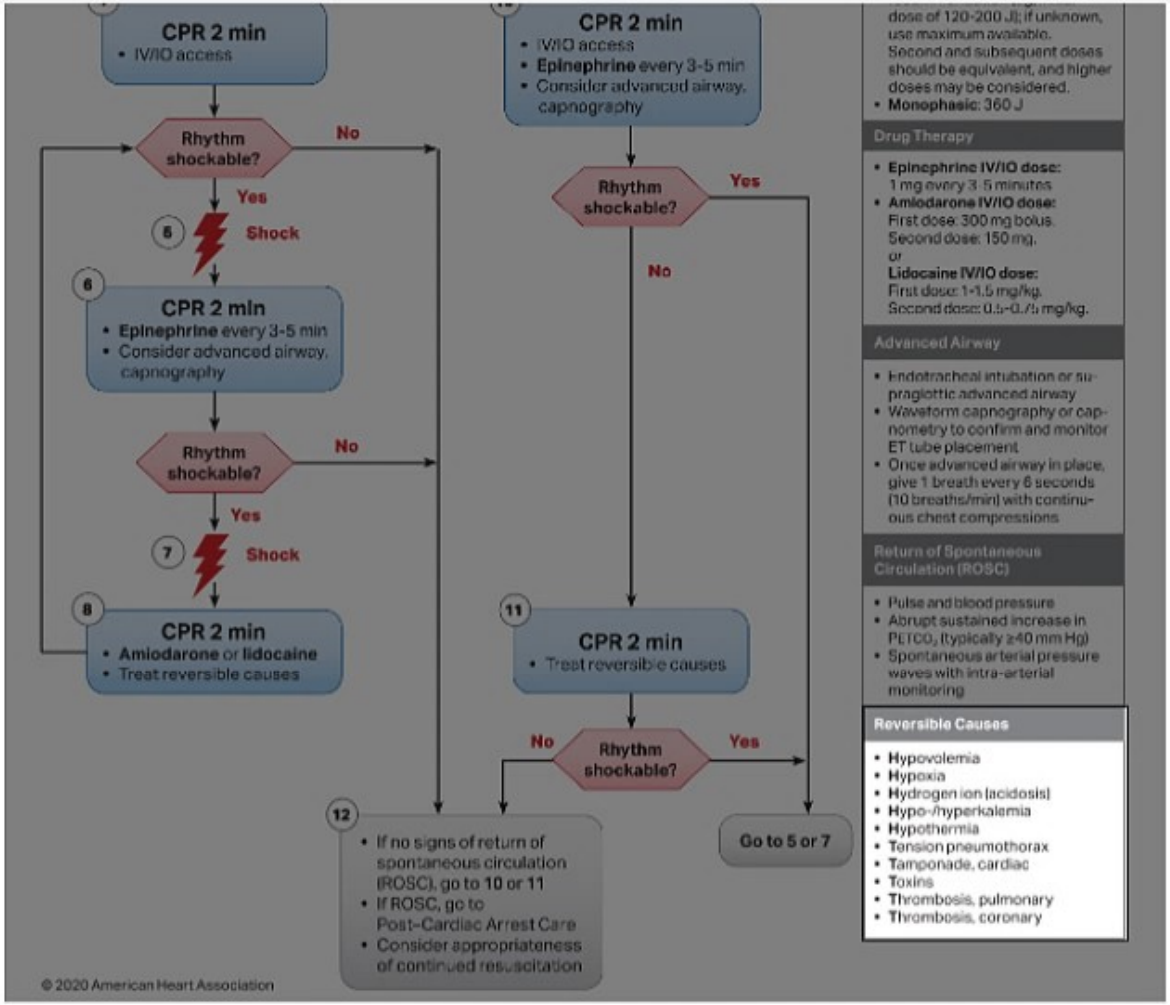
Treating PEA goes beyond the interventions in the algorithm. As you assess the patient, try to identify evidence of an underlying cause and correct it if present. Stop, think, and ask, "**Why did this person have this cardiac arrest at this time?**" You must search for and treat reversible causes of PEA for resuscitative efforts to be potentially successful. Use the **H's and T's** to recall conditions that could have contributed to PEA, and remember that **hypovolemia and hypoxia are the 2 most common underlying, potentially reversible causes of PEA.**



PREVIOUS 1 2 3 4 5 NEXT

CHALLENGE US

MANAGEMENT OF ASYSTOLE/PEA



When is the recommended point to administer epinephrine to a patient with asystole?

CHOOSE THE CORRECT ANSWER

After securing the patient's airway

After treating reversible causes

After the first 2-minute CPR cycle

✓ As soon as IV/IO access is available

I KNOW IT | THINK I KNOW IT | NOT SURE | NO IDEA

When is the **recommended point** to administer **epinephrine** to a patient with **asystole?**

You got it!

Your Answer | As soon as IV/IO access is available

I Know It

CHALLENGE US

NEXT

In addition to hypoxia, what is the most common underlying, potentially reversible cause of pulseless electrical activity?

CHOOSE THE CORRECT ANSWER

- Thrombosis
- Hypothermia
- Tension pneumothorax
- ✓ Hypovolemia

I KNOW IT | THINK I KNOW IT | NOT SURE | NO IDEA

In addition to hypoxia, what is the most common underlying, potentially reversible cause of **pulseless electrical activity?**

You got it!

Your Answer | Hypovolemia

I Know It

CHALLENGE US

NEXT

77% PROGRESS: HeartCode ACLS 2025

~2h 57m left

Ahmed Othman

Which therapy is **not supported by evidence** for use in patients with **cardiac arrest secondary to hypothermia?**

Not there yet...

Your Answer | Vasopressors

Correct Answer | Antiarrhythmics

Learn more here: VF/pVT in Accidental Hypothermia

I Know It

CHALLENGE US

NEXT

VF/PVT IN ACCIDENTAL HYPOTHERMIA

Treating VF/pVT in Accidental Hypothermia

Defibrillation is appropriate for cardiac arrest patients in VF/pVT with severe accidental hypothermia (a body temperature of less than 30°C/86°F). If a patient does not respond to the initial shock, it is reasonable to perform additional defibrillation attempts by using BLS guidelines while actively rewarming. Hypothermic patients may have a reduced rate of drug metabolism, and drugs may accumulate to toxic levels with standard dosing regimens. **It is reasonable to consider administering a vasopressor according to the standard ACLS algorithm while rewarming**, although evidence does not support using antiarrhythmic drug therapy for hypothermic patients in cardiac arrest.

For patients in cardiac arrest with severe accidental hypothermia, for in-hospital patients, aim ACLS treatment at **rapid core rewarming**.

For patients in cardiac arrest with moderate hypothermia (30°C to 34°C, or 86°F to 93.2°F), **start CPR**, attempt **defibrillation**, **give medications according to local protocols**, and, if in-hospital, provide **active core rewarming**.

CHALLENGE US

Which **alteration to the standard ACLS algorithm** is appropriate for patients whose **cardiac arrest is caused by hypothermia?**

Not there yet...

Your Answer | Increased medication doses

Correct Answer | Medications spaced at longer intervals

Learn more here: VF/pVT in Accidental Hypothermia

Think So

CHALLENGE US

NEXT

OPIOID OVERDOSE

Respiratory or Cardiac Arrest Associated With Opioid Overdose

Isolated opioid toxicity is associated with central nervous system (CNS) and respiratory depression that can progress to respiratory and cardiac arrest. Most opioid deaths involve ingesting multiple drugs or having medical and mental health comorbidities. In addition, **methadone and propoxyphene can cause torsades de pointes**, and cardiotoxicity has been reported with other opioids. Except in specific clinical settings (eg, unintended opioid overdose during a medical procedure), rescuers cannot be certain that the patient's clinical condition is due to opioid-induced CNS and respiratory depression toxicity alone.

Naloxone is a potent opioid receptor antagonist in the brain, spinal cord, and gastrointestinal system. Naloxone has an excellent safety profile and can rapidly reverse CNS and respiratory depression in a patient with an opioid-associated resuscitative emergency. Depending on their training and clinical circumstance, rescuers can **administer naloxone intravenously, intramuscularly, intranasally, or subcutaneously**; nebulize it for **inhalation**; or instill it into the bronchial tree via **endotracheal tube**.

A patient with suspected opioid poisoning is not breathing normally but has a pulse. What is your next step?

CHOOSE THE CORRECT ANSWER

Monitor and observe

✓ Provide rescue breathing and give naloxone

Transport to the hospital

Start CPR and use an AED

I KNOW IT | THINK I KNOW IT | NOT SURE | NO IDEA

A patient with suspected opioid poisoning is not breathing normally but has a pulse. What is your next step?

You got it!

Your Answer | Provide rescue breathing and give naloxone

I Know It

CHALLENGE US

NEXT

Depending on training and clinical circumstance, how can rescuers administer naloxone?

SELECT ALL THAT APPLY

- [x] Intramuscularly
- [x] Intranasally
- [x] Intravenously
- [ ] Transdermally
- [ ] Orally

I KNOW IT | THINK I KNOW IT | NOT SURE | NO IDEA

Depending on training and clinical circumstance, how can rescuers administer naloxone?

You got it!

- Your Answer | Intravenously
- Your Answer | Intramuscularly
- Your Answer | Intranasally

I Know It

CHALLENGE US

NEXT

EXTRACORPOREAL MEMBRANE OXYGENATION CPR (ECPR)

ECPR refers to **venoarterial extracorporeal membrane oxygenation during cardiac arrest**, including extracorporeal membrane oxygenation and cardiopulmonary bypass. ECPR techniques require adequate vascular access and specialized equipment.

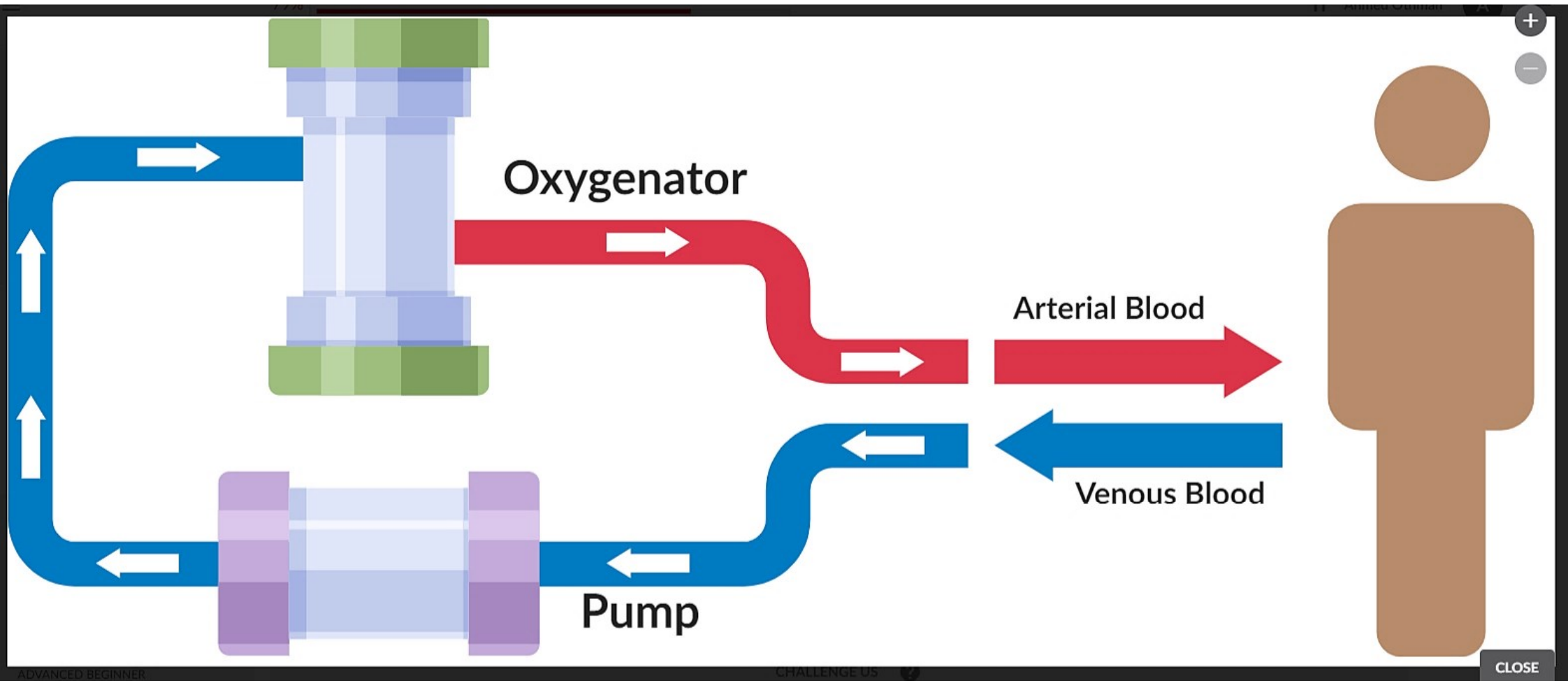
By using ECPR, providers may support vital organs with perfusion and gas exchange while reversible causes of cardiac arrest are treated. ECPR can also serve as a bridge for left ventricular (LV) assist device implantation or cardiac transplantation.

Consider ECPR in settings where the necessary equipment and trained personnel can be deployed rapidly for select cardiac arrest patients with known or suspected reversible causes of cardiac arrest in whom conventional ACLS has failed.

Below you can see a schematic depiction of components of extracorporeal membrane oxygenation, or ECMO, circuit as used for ECPR. Components include a venous cannula, a pump, an oxygenator, and an arterial cannula.

I KNEW | GOT IT NOW | THINK I GOT IT | I DON'T GET IT

CHALLENGE US


Oxygenator
Arterial Blood
Venous Blood
Pump

What roles does ECPR fill in the management of cardiac arrest?

SELECT ALL THAT APPLY

- [ ] Reduces oxygen consumption of the brain
- [x] Provides vital organ support while treating reversible causes
- [ ] Aids in reducing coagulopathies
- [x] Serve as a bridge for left ventricular assist device implantation
- [ ] Filters excess hydrogen ions from the bloodstream

I KNOW IT | THINK I KNOW IT | NOT SURE | NO IDEA

What roles does **ECPR** fill in the management of cardiac arrest?

You got it!

Your Answer | Provides vital organ support while treating reversible causes

Your Answer | Serve as a bridge for left ventricular assist device implantation

I Know It

CHALLENGE US

NEXT

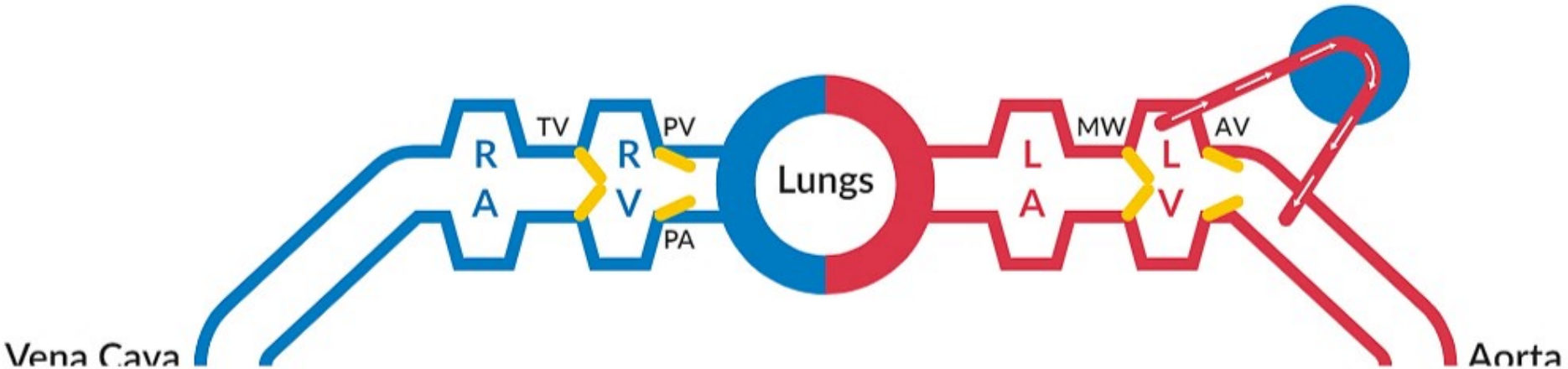
VENTRICULAR ASSIST DEVICES

- A left ventricle with a **left ventricular assist device** (LVAD)
- A right ventricle with a **right ventricular assist device** (RVAD)
- Both ventricles with a **biventricular assist device**

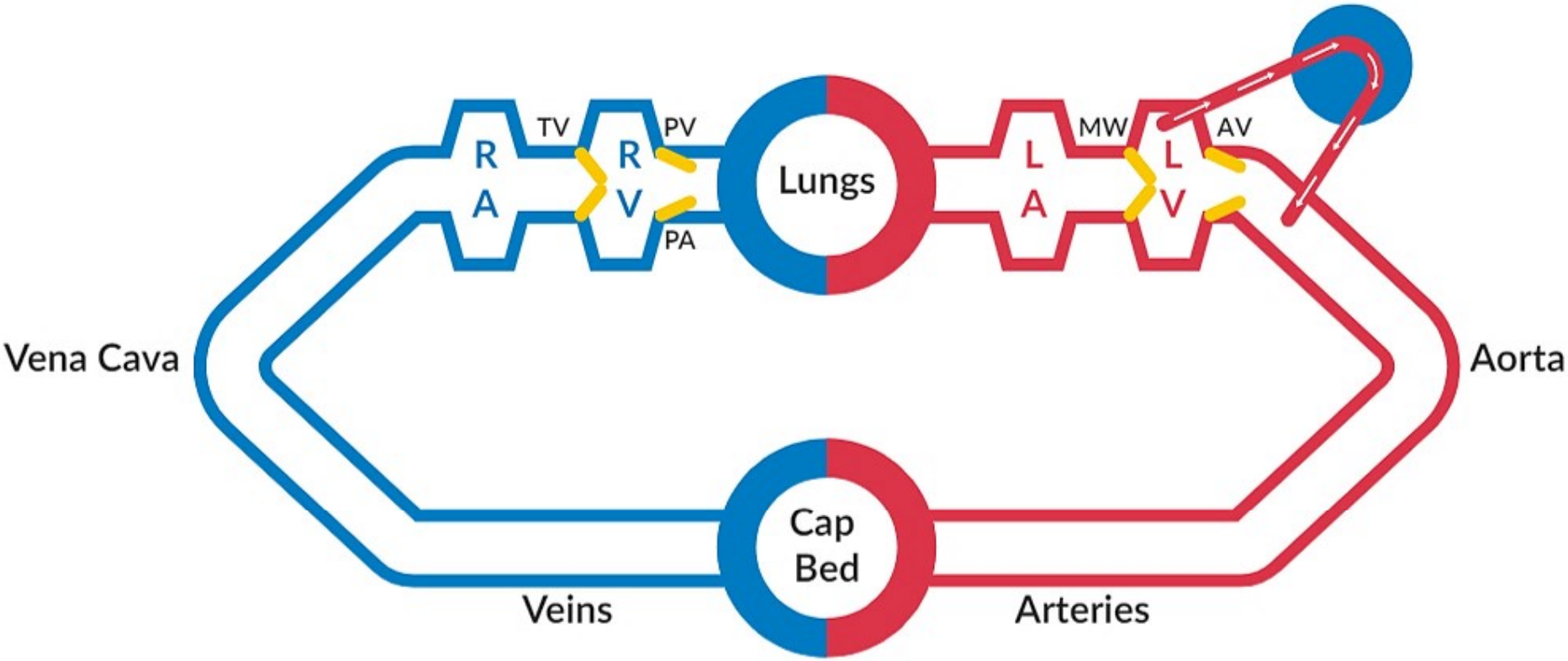
LVADs can have 2 distinctly different mechanisms of blood flow and, therefore, are different physiologically:

- **Pulsatile-flow** LVADs (older technology, rarely used)
- **Continuous-flow** LVADs (the current generation of devices)

LVAD



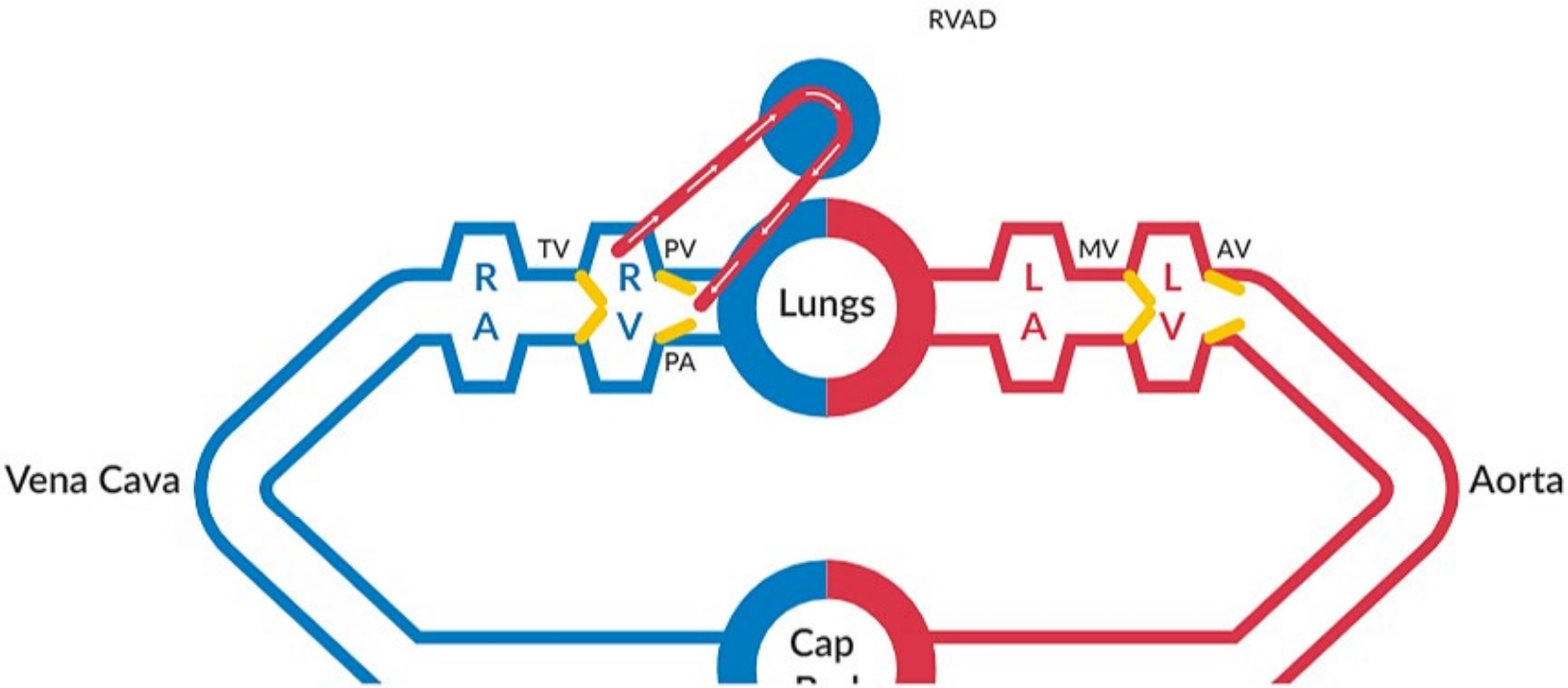
VENTRICULAR ASSIST DEVICES



Because palpable pulses are often absent in patients with continuous-flow LVADs, it is important to understand the differences in the physical exam and in methods that can help rescuers determine if an unresponsive or mentally altered patient is, in fact, in cardiac arrest or circulatory collapse.

VENTRICULAR ASSIST DEVICES

With an **RVAD**, the inflow is the right ventricle or atrium, and the outflow is the main pulmonary artery, just distal to the pulmonic valve.

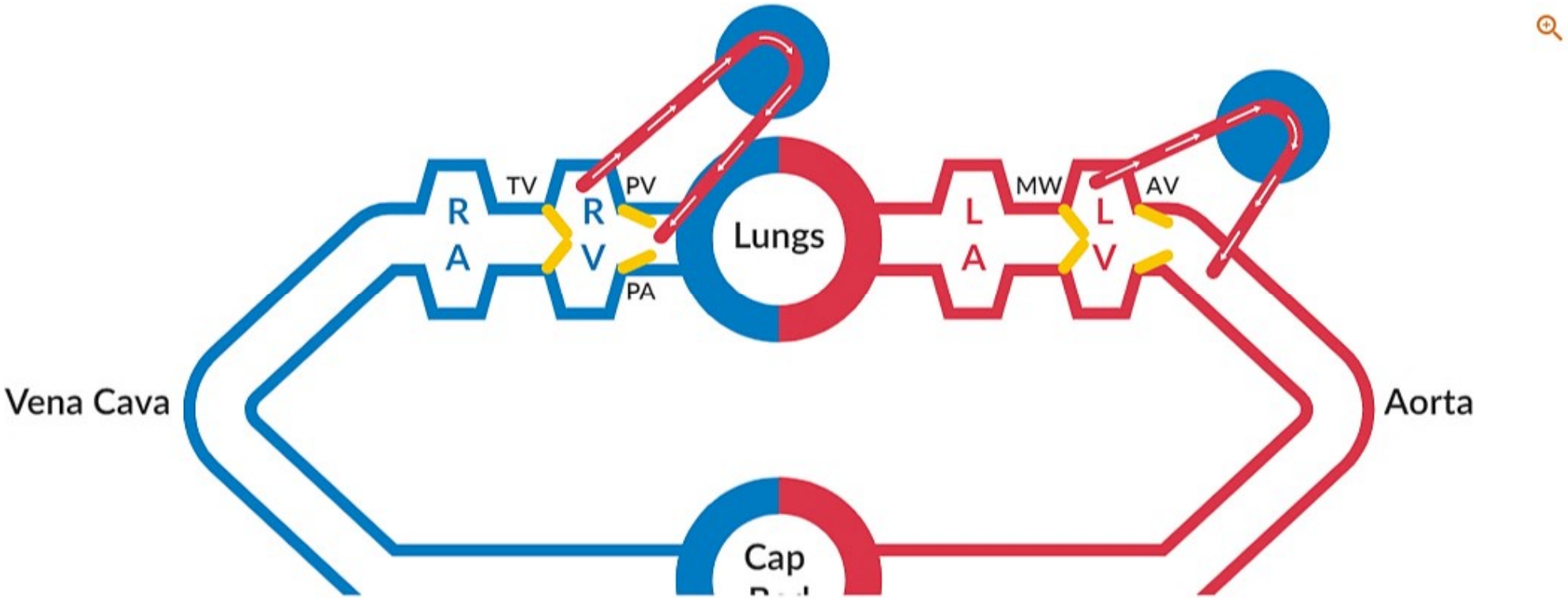


CHALLENGE US

VENTRICULAR ASSIST DEVICES

When an LVAD and an RVAD are **used in the same patient simultaneously**, the patient is referred to as having biventricular support or a **biventricular assist device**, indicating that **both ventricles are supported mechanically**. A total artificial heart replaces the heart itself. Most patients who are discharged home with mechanical circulatory support currently have a durable LVAD.

Biventricular assist device



VENTRICULAR ASSIST DEVICES

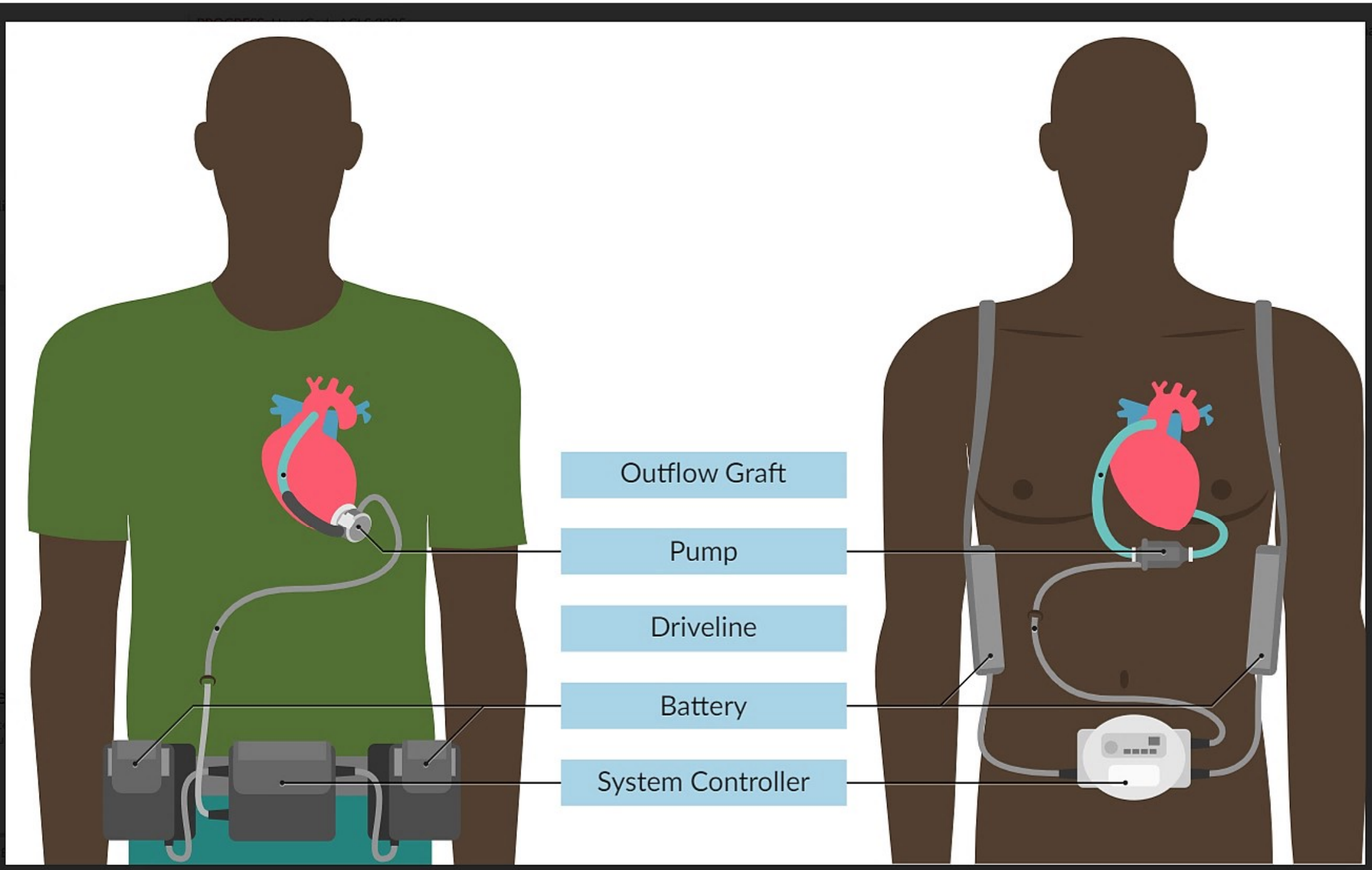
Causes of Pump Failure

The 2 most common causes of pump failure are disconnection of the power or of the driveline. Therefore, the first step in assessing an unresponsive, mentally altered, or hypotensive VAD patient is to ensure that all connections are secure and an adequate power source is connected.

Controller malfunction, damage, or disconnection can also lead to pump dysfunction or stoppage. All patients should have a backup controller with them, as well as backup batteries for emergency replacement, in case of damage or malfunction. EMS providers must keep patients and their backup equipment together at all times because replacement equipment may be limited or nonexistent at receiving hospitals, particularly at non-VAD centers. To reiterate, when a mechanical circulatory support patient is transported by EMS, all of the patient's VAD equipment must accompany him or her to the hospital to ensure continued mechanical support.

The driveline that connects the controller to the device is a potentially vulnerable component and is subject to wear, damage, or kinking, which can result in device malfunction. Although driveline wiring has built-in redundancy as a safety measure, driveline trauma can cause internal damage and lead to pump failure. Damage can be acute, such as a cutting or crush injury, or it can be the result of chronic stress or fatigue on the line. In these settings, there will often be alarms preceding or accompanying the pump stoppage, but alarms will cease once the batteries are drained.

Intracorporeal pumps

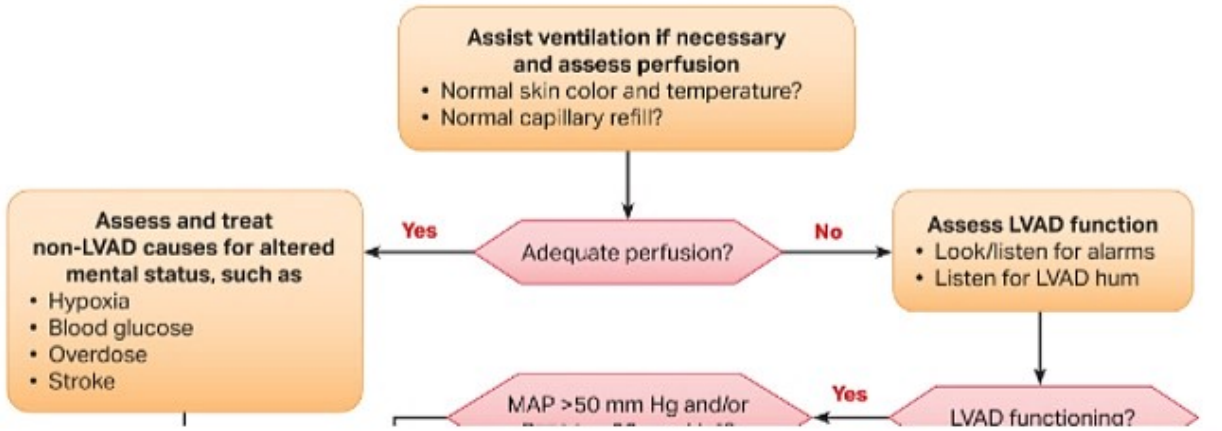

Outflow Graft
Pump
Driveline
Battery
System Controller

VENTRICULAR ASSIST DEVICES

Adult Ventricular Assist Device Algorithm

The Left Ventricular Assist Device Algorithm outlines consensus-derived recommendations for first responder assessment of a patient with an LVAD. Identifying the presence of mechanical circulatory support and code status is of initial importance. Some destination therapy patients with LVADs will have a legally executed, valid DNAR status and should be treated as any other patient with such a request. Obtain information from caregivers and medical alert identifications or wallet cards to ensure definitive patient identification. It seems reasonable for VAD centers to standardize their approach to patient identification.

Adult Ventricular Assist Device Algorithm



PREVIOUS 1 2 3 4

I KNEW | GOT IT NOW | THINK I GOT IT | I DON'T GET IT

CHALLENGE US

How will the current generation of continuous-flow left ventricular assist devices complicate the BLS Assessment?

CHOOSE THE CORRECT ANSWER

- ✓ The devices will not produce a pulse
- Defibrillation is ineffective with left ventricular assist devices
- The devices will interfere with AED operation
- The devices will produce abnormal breathing patterns

I KNOW IT | THINK I KNOW IT | NOT SURE | NO IDEA

How will the current generation of **continuous-flow left ventricular assist devices** complicate the **BLS Assessment?**

You got it!

Your Answer | **The devices will not produce a pulse**

I Know It

CHALLENGE US

NEXT

You are assessing an **unresponsive patient** known to have an implanted **left ventricular assist device (LVAD)**. The patient is not breathing, the patient's skin is pale and cool, and capillary refill is inadequate.

How do you assess whether the LVAD is functioning?

CHOOSE THE CORRECT ANSWER

- ✓ Listen for device hum
- Assess the carotid pulse
- Auscultate for heart sounds
- Measure blood pressure with a large cuff

I KNOW IT | THINK I KNOW IT | NOT SURE | NO IDEA

You are assessing an **unresponsive patient** known to have an implanted **left ventricular assist device (LVAD)**. The patient is not breathing, the patient's skin is pale and cool, and capillary refill is inadequate.

How do you assess whether the LVAD is functioning?

You got it!

Your Answer | Listen for device hum

I Know It

CHALLENGE US

NEXT

A patient with a ventricular assist device (VAD) is **not breathing**, has signs of **inadequate perfusion**, and is **unconscious**. You determine the **VAD is functioning**. After endotracheal intubation, the patient has a **P_{ETCO_2} of 12 mm Hg**.

What is your next action?

CHOOSE THE CORRECT ANSWER

- Turn off the VAD controller briefly and restart it
- Replace the VAD controller and batteries
- ✓ Perform external chest compressions
- Administer transtracheal epinephrine

I KNOW IT | THINK I KNOW IT | NOT SURE | NO IDEA

A patient with a ventricular assist device (VAD) is **not breathing**, has signs of **inadequate perfusion**, and is **unconscious**. You determine the **VAD is functioning**. After endotracheal intubation, the patient has a **$PETCO_2$ of 12 mm Hg**.

What is your next action?

You got it!

Your Answer | Perform external chest compressions

I Know It

CHALLENGE US

NEXT

CARDIAC ARREST ASSOCIATED WITH PREGNANCY

During attempted resuscitation of a pregnant woman, providers have 2 potential patients: the mother and the fetus. The best hope for fetal survival is maternal survival. For the critically ill pregnant patient, rescuers must provide appropriate resuscitation with consideration of the physiologic changes due to pregnancy.

At approximately 20 weeks or more of pregnancy (and possibly earlier), the size of the uterus begins to adversely affect the attempted resuscitation. At approximately 24 to 25 weeks of gestational age, the fetus may be able to survive outside the womb.

Decisions About Cesarean Delivery

The decision about whether to perform an emergency cesarean delivery must be made quickly when the mother is in cardiac arrest. Emergency cesarean delivery—also known as *hysterotomy*—may improve the outcome for both mother and child.

CARDIAC ARREST ASSOCIATED WITH PREGNANCY

Key Interventions: Prevention of Cardiac Arrest in Pregnancy

To treat the critically ill pregnant patient:

- **Place the patient in the left-lateral decubitus position** to relieve possible compression of the inferior vena cava. Uterine obstruction of venous return can produce hypotension and could precipitate arrest in the critically ill patient.
- Two methods of supporting the patient in the left-lateral decubitus position are (1) to **use the angled backs of 2 or 3 chairs** or (2) to **use the angled thighs of several providers**. Overturn a 4-legged chair so that the top of the chair back touches the floor. Align 1 or 2 more overturned chairs on either side of the first so that all are tilted in the same manner. Place the woman on her left side and align her torso parallel with the chair backs. Remember that this position will not be practical if chest compressions are needed.

Left-lateral decubitus position

CARDIAC ARREST ASSOCIATED WITH PREGNANCY

Left-lateral decubitus position

- Give **100% oxygen**.
- Establish **IV access above the diaphragm** and give a **fluid bolus**.
- **Assess for hypotension**; maternal hypotension that warrants therapy is defined as a **systolic blood pressure (SBP) less than 100 mm Hg or less than 80% of baseline**. Maternal hypotension can cause a reduction in placental perfusion. In the patient who is not in arrest, both crystalloid and colloid solutions increase preload.
- **Consider reversible causes of cardiac arrest** and **identify any preexisting medical conditions** that may be complicating the resuscitation.

CARDIAC ARREST ASSOCIATED WITH PREGNANCY

Techniques to Improve Maternal Hemodynamics

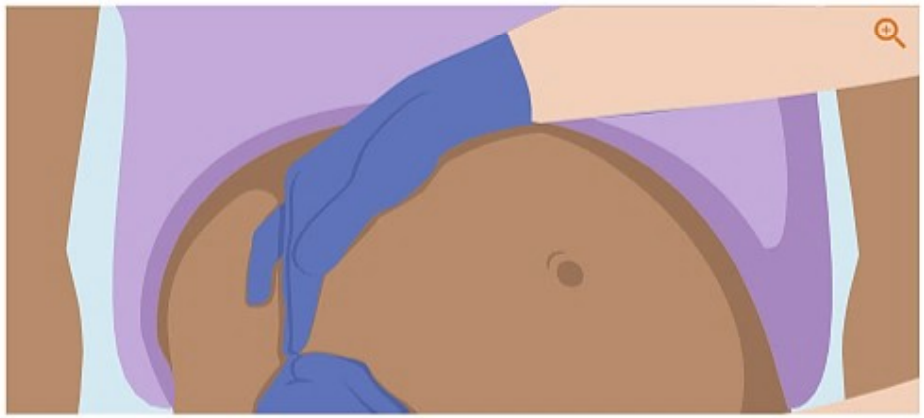
Click on the buttons below to see techniques to improve **maternal hemodynamics** during cardiac arrest.

Shifting the Gravid Uterus

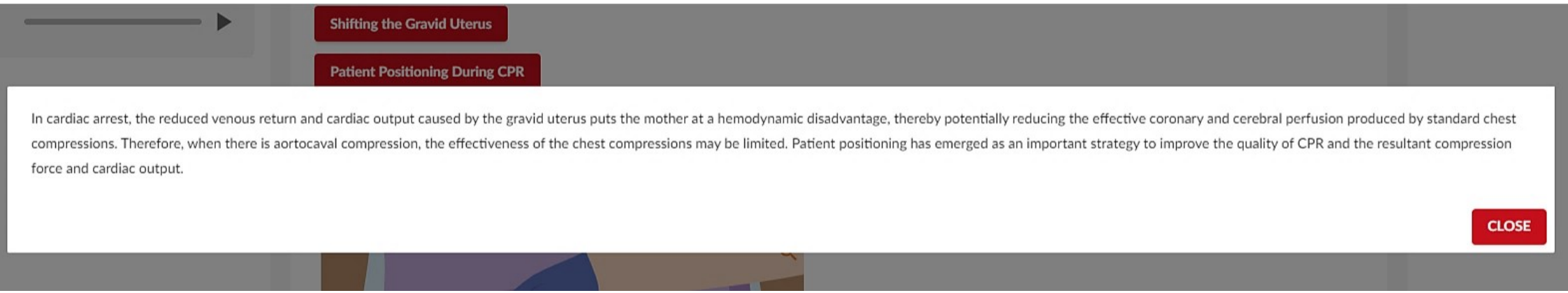
Patient Positioning During CPR

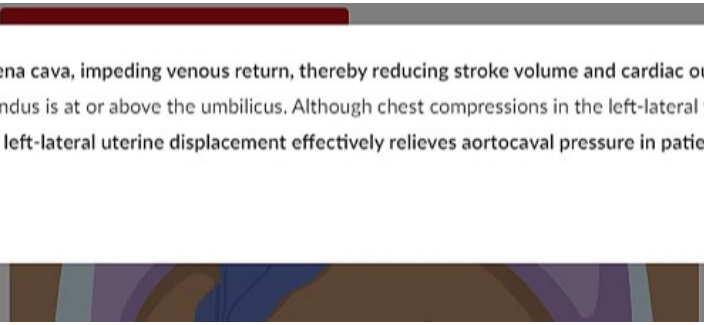
Chest Compressions in the Left-Lateral Tilt

Manual Left Uterine Displacement



Manual left uterine displacement performed with 2-handed technique during resuscitation


Shifting the Gravid Uterus
Patient Positioning During CPR
In cardiac arrest, the reduced venous return and cardiac output caused by the gravid uterus puts the mother at a hemodynamic disadvantage, thereby potentially reducing the effective coronary and cerebral perfusion produced by standard chest compressions. Therefore, when there is aortocaval compression, the effectiveness of the chest compressions may be limited. Patient positioning has emerged as an important strategy to improve the quality of CPR and the resultant compression force and cardiac output.
CLOSE



The gravid uterus can compress the inferior vena cava, impeding venous return, thereby reducing stroke volume and cardiac output. In general, aortocaval compression can occur for singleton pregnancies at approximately 20 weeks of gestational age, at about the time when the fundus is at or above the umbilicus. Although chest compressions in the left-lateral tilt position are feasible in a manikin study, they result in decreased CPR quality (less forceful chest compressions) than is possible in the supine position. **Manual left-lateral uterine displacement effectively relieves aortocaval pressure in patients with hypotension**.

CLOSE

Chest Compressions in the Left-Lateral Tilt

Chest compressions performed while the patient is tilted are not ideal. Although it is feasible to perform chest compressions in the tilted patient, chest compressions performed in the tilted position are less forceful when compared with the supine position. However, there are no physiologic data available for chest compressions in the tilted position. High-quality chest compressions are essential to maximize the chance of a successful resuscitation. An alternative method of relieving aortocaval compression, such as manual displacement, may be more practical and ideal during resuscitation because it allows for continuous and easier delivery of all other aspects of resuscitation, including high-quality chest compressions, defibrillation, IV access, and intubation.

CLOSE

Chest Compressions in the Left-Lateral Tilt

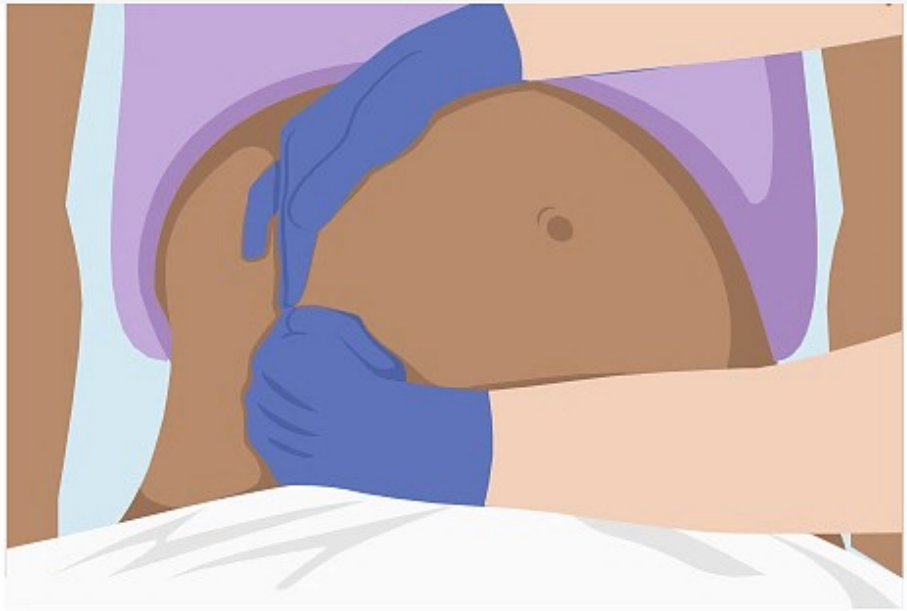
Relieve compression of the inferior vena cava and the aorta by **shifting the gravid uterus left and upward off the maternal vessels**:

- Stand on the left side of the patient, level with the top of the uterus.
- Reach across the midline with both hands and pull the gravid uterus leftward and upward toward your abdomen.
- If it is not possible to stand to the left of the patient, use one hand to push the gravid uterus to the patient's left and upward.

CLOSE

Manual left uterine displacement performed with 2-handed technique during resuscitation

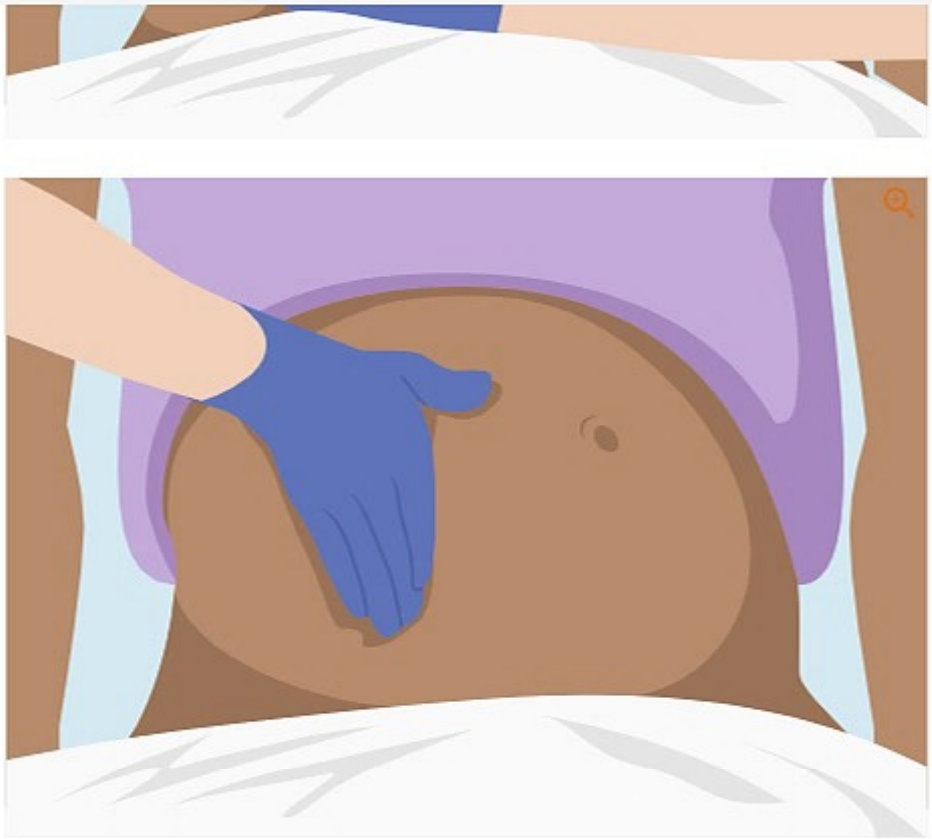
CARDIAC ARREST ASSOCIATED WITH PREGNANCY



Manual left uterine displacement performed with 2-handed technique during resuscitation

Manual left uterine displacement performed with 1-handed technique

CARDIAC ARREST ASSOCIATED WITH PREGNANCY



Manual left uterine displacement performed with 1-handed technique

ACLS for Pregnant Women

Because immediate ROSC cannot always be achieved, local resources for a perimortem cesarean delivery should be summoned as soon as cardiac arrest is recognized in a woman in the second half of pregnancy. Systematic preparation and training are the keys to a successful response to such rare and complex events. Care teams that may be called upon to manage these situations should develop and practice standard institutional responses to allow for smooth delivery of resuscitative care.